AMERICAN
DYESTUFF REPORTER
DEVOTED TO THE INTERESTS OF TEXTILE CHEMISTRY
BLEACHING • DYEING • FINISHING • PRINTING

VOLUME XX | MARCH 2, 1931 | NUMBER 4

DYESTUFF MAKERS · GEIGY · SINCE 1859

. . . . . give your bathing suit a chance to "make good"— with Geigy Polar Colors

In U. S. and Canada:
Sole Selling Agents for
J. R. GEIGY S. A.
Basle, Switzerland

BRANCHES:
Boston, Providence, Cincinnati, Charlotte, N. C., Philadelphia, Toronto, Portland, Ore., Columbus, Ga.

Geigy Company Inc.
89-91 BARCLAY STREET
NEW YORK, N. Y.

In Great Britain:
THE GEIGY COLOUR CO., LTD.
National Bldgs., Parsonage, Manchester

Branch Works at Clayton

Established 1764—J. R. GEIGY S. A.—Manufacturers of dyestuffs since 1859

OFFICIAL PUBLICATION OF THE AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

A full white bleach . . . . .

in 2 simple operations!

The *Becco* (Electrolytic Hydrogen Peroxide) process eliminates some six or seven slow and unnecessary bleaching operations. In just two steps, this improved process brings the goods to the white bin permanently white, thoroughly clean and with a fine, soft feel—*with no higher bleaching costs.*

Becco bleaching processes are applicable with superior results to all kinds of textiles—cottons, wools, silks, rayons and mixtures thereof. Yardage losses are reduced due to their gentle application and the goods take on dyes with brighter results for reason of absorbency. *Becco* bleaching processes are completed in from 2 to 14 hours.

Since *Becco* bleaching depends almost entirely on the chemicals themselves, any type of equipment can be adapted to this process. Changes in equipment are seldom necessary; if so, the expense is slight.

Becco electrolytic hydrogen peroxide 100 volume is highly stable in alkaline solutions. It is not dangerous nor disagreeable to handle and does not deteriorate in storage.

Send us samples of your goods, as an experiment, and let us put them thru the Becco process for you. Or better still, allow us to come to your plant and demonstrate. No obligation.

BECCO

BUFFALO ELECTRO-CHEMICAL CO. INCORPORATED

BUFFALO, NEW YORK

BECCO

BOSTON - NEW YORK - PHILADELPHIA - CHICAGO - CHARLOTTE - TORONTO - MONTREAL

American Dyestuff Reporter, Vol. XX, No. 4. March 2, 1931. Published twenty-two times a year by Howes Publishing Co., Inc., 440 Fourth Ave., New York, N. Y. Domestic subscription, $5.00; Canadian, $5.50; foreign, $6.00. Entered as second-class matter, Nov. 6, 1919, at the New York, N. Y., Post Office, under the Act of March 3, 1879. Copyrighted 1930, by Howes Publishing Co.

Contents of This Issue

Contents of previous issues can be found by consulting the Industrial Arts Index at your library

March 2, 1931

Determination of pH of Cotton Cloth and Study of Its Relations to Tensile Strength 133
By S. I. Kolsky and B. M. Jones

Organized Resistance to Design Piracy..... 139
By Waldon Fawcett

Proceedings of the American Association of Textile Chemists and Colorists

Calendar of Coming Events.....(73) 141

January Meeting of New York Section.(73) 141

Formic Acid in the Textile Industry...(76) 144
A Paper by K. L. Schanbacher

January Meeting of the Rhode Island Section .....(79) 147

Winter Meeting of the Piedmont Section .....(80) 148

Purchasing for Textile Mills and Some Commercial Aspects of Same.....(80) 148
A Paper by Hill Hunter

Bleaching with Liquid Chlorine or Hydrogen Peroxide 100 Volume for Hosiery .....(83) 151
A Paper by G. H. Dubois

South Central Section Meeting.....(84) 152

Editorials:

Ten Commandments for Foremen..... 153

Stability of Employment..... 155

Silk in the Molecular Still..... 155
By R. T. Mease and Wm. D. Appel

Technical Notes from Foreign Sources.. 160

THE ONE METHOD

FOR PRODUCING LIGHT SHADES IN ONE OPERATION

Manufacturers, who are whittling their pencils to reduce costs without impairing quality, may find one major solution in the dyehouse with—

AUTO GYP
Process of Bleaching and Dyeing
IN ONE OPERATION

From unbleached goods to light shades and colors of medium depth—in one operation—in less than 2½ hours' time.

SURPASS-ing quality at lower costs.

Complete information gladly given, including demonstration in your own dye house.

"Surpalite for Scouring, Bleaching and Dyeing Rayon in one Operation"

SURPASS CHEMICAL COMPANY

OFFICE, FACTORY, LABORATORIES
1254-56 BROADWAY—ALBANY, N. Y.

NATIONAL *Solantine* DYES

A comprehensive line of FAST-TO-LIGHT DIRECT DYES

National Solantine Yellow 4GL
National Solantine Yellow FF Conc.
National Solantine Orange 4G Conc.
National Solantine Orange G
National Solantine Red 8BLN
National Solantine Red 8BL
National Solantine Pink 4BL
National Solantine Grey GL Conc.
National Solantine Violet R
National Solantine Violet FFR
National Solantine Violet FFB
National Solantine Blue 4GL
National Solantine Blue 2GL
National Solantine Blue FF
National Solantine Blue R
National Solantine Black L
National Solantine Brown R
National Solantine Brown 4R

[National Solantine Dyes possess good all-around fastness, but their predominating characteristic is their fastness to light. They are especially popular for drapery, curtain and upholstery materials.]

NATIONAL DYES

NATIONAL ANILINE & CHEMICAL CO., INC.
40 Rector Street New York, N. Y.

BOSTON 150 Causeway St. PHILADELPHIA 200-204 S. Front St. CHARLOTTE 201-203 W. First St. CHICAGO 357 W. Erie St. PROVIDENCE 15 Westminster St. SAN FRANCISCO 145 Second St. TORONTO 137-145 Wellington St. West

AMERICAN DYESTUFF REPORTER

"Circulated Everywhere Dyestuffs Are Used"

Published by Howes Publishing Company, 440 Fourth Avenue, New York

Devoted to the practical application of dyestuffs in all industries; especially to textile chemistry—the science and practice of scouring, bleaching, dyeing and finishing.

Volume XX | MARCH 2, 1931 | Number 4

Determination of pH of Cotton Cloth and Study of Its Relation to Tensile Strength*

By S. I. KOLSKY and B. M. JONES

IT HAS been shown many times in the past that relatively small amounts of acid or alkali have caused tendering in cotton cloth at some stage in its processing or even after long storing. Very little work has been done to investigate practicable methods for determining slight traces of acid or alkali in cotton cloth, and their effect on tensile strength. It is not generally known whether a technically bleached cotton cloth is acid or alkaline in reaction when it comes from the bleachery or before it is put through the dyeing or other processes. There is thus an evident need for a practicable method of determining the acidity or alkalinity of cloth.

Work Done by Others

Some more or less qualitative information is available in Matthews' "Textile Fibers"; but a search of the literature revealed that only one investigation, directly along the lines of this research, was published. Qualitative tests for acidity or alkalinity are of no great value; but certain indicators may be used to show comparative acid or alkali content from the colors produced by spotting the cloth. Thus, 0.005% H_2SO_4 gives a red spot with Methyl Red, and the same indicator turns yellow with 0.005% NaOH. A spot of KI-KIO_3 starch turns blue on 0.01% H_2SO_4, while a Brom Thymol spot turns green on 0.02% NaOH. Lackmoid turns red on 0.06% H_2SO_4, and Phenolphthalein turns pink on 0.12% NaOH. Methyl Orange shows a pink color for acidities of from 0.1 to 0.16% H_2SO_4, and Thymol Blue, a purple color for 0.16% H_2SO_4. It is apparent that such testing is limited in application. Even titrations with deci-normal caustic solutions are unsatisfactory because if the cloth is removed from its boiled extract, much acid is removed with it; and if the titration is attempted with the cloth left in the liquor, the cotton has a preferential attraction for the basic constituents of the neutral salt formed and this results in error. At the boil, with Phenolphthalein as indicator, titrations with N/50 solutions give an error of 0.01% HCl or H_2SO_4 and 0.02% NaOH.

The one published report, a research by Clibbens and Geake[1], shows that complete removal of "combined" acid from cotton cloth cannot be accomplished even after boiling in dilute caustic for over six hours (as evidenced by its methylene blue absorption—which is roughly proportional to the combined acid). Their method consisted in ashing the cotton sample in the presence of alkali and then determining by the so-called micro-gravimetric methods the $BaSO_4$ or AgCl in the solution of the ash. They show that one milligram of H_2SO_4 or HCl can thus be determined in one or two grams of cloth; but they fail to take into consideration the presence of natural sulphur or chlorine in the fabric. It was found from their tests that technically bleached and scoured cottons contain an average of 0.02% H_2SO_4 or HCl.

It was learned, on further inquiry,[2] that Cluett-Peabody & Co., Inc., have been studying the effects of acids and alkalies on cotton cloth. Their tests were made by dipping strips of cloth into various concentrations of acids, and then heating for 30 seconds at 400° F., and then testing for tensile strength. They compiled charts and data; and it was noted that tensile strength decreased with increased acid concentration at constant temperature, and that tensile strength decreased with increased temperature with constant acid concentration. Further information in this regard was obtained from Matthews' "Textile Fibers," as follows[3]:

* Presented in partial fulfilment of the requirements for a degree of B.T.C. at the Lowell Textile Institute, 1930.

Cotton loses tensile strength after heating above a certain temperature, due to the action of steam, air, and temperature.

Dilute, non-volatile acids that are dried on the fiber tender it, and heating increases tendering due to hydrolysis. A molecular change takes place and hydrocellulose is formed.

Hydrochloric acid weakens the fiber more than sulphuric acid of the same strength. Volatile organic acids have no injurious effect, but non-volatile organic acids act much the same as mineral acids, especially at high temperatures. The destructive action in this case is caused by crystallization of the acid within the fiber and the subsequent breaking down of the cell walls.

Tendering of sulphur-dyed samples is caused by liberation of H_2SO_4 on storing. When exposed to 120° C. for 24 hours, sulphur-dyed samples lose as much as 80 per cent in strength.

Alkalies are harmless under ordinary conditions, and even boiling alkali solutions have no injurious effect if air is excluded. In the presence of air, however, hydrolysis, similar to that with acids, takes places. This tendering is probably due to formation of oxycellulose.

The collected information thus offered several methods for attacking the problem, namely; by titration, by the gravimetric method, by pH determinations, and by heat treatment of cotton cloth containing various degrees of acidity or alkalinity with subsequent testing for tensile strength.

Modern plants have found much application for pH determinations in controlling acidity and alkalinity in various processes, and so it was thought that use of such principles might be suitable for the work at hand. For making such determinations, the electrical methods involve less danger of error, due to the human factor, than the colorimetric methods, and are applicable even in colored solutions. There are two types of electrical pH determinations that are suitable.[4] Both types involve the use of a potentiometer for balancing known voltage against the unknown voltage of a cell dipping in the solution under examination. This cell may contain:

(1) a hydrogen electrode—a platinum electrode saturated with hydrogen,

(2) a quinhydrone electrode—a gold or platinum electrode and saturated with quinhydrone.

The hydrogen electrode is the fundamental standard for these measurements, but is not so simple to operate as the other. The best choice appears to be the quinhydrone electrode which is simpler to operate, and under some conditions is more accurate than the hydrogen electrode. It is particularly useful in acid solutions and works moderately well in alkaline solutions, but as pH rises one must work rapidly to get good results.

Bibliography.

1. Clibbens & Geake—The Determination of Combined H_2SO_4 and HCl in Cotton.

2. Cluett-Peabody & Co.—Research information (not published).

3. Matthews—Testing Cotton Fabrics for Acid Textile Fibers, 4th Edition, page 521.

4. Dr. H. C. Chapin—Electrical Methods of Measuring and Automatically Controlling Chemicals. Am. Dyestuff Rep. oVl. 17, page 120.

1. *Determination of the pH of Cotton Samples.*

No detailed outline for an efficient procedure was found in the literature, and so, before anything else could be done, such a procedure had to be created. This involved a basic study of the application of the quinhydrone cell to the needs of this research. W. M. Clark's book, Determination of Hydrogen Ions, provided a basis upon which to start. Because of the limited time available the final series of pH determinations was restricted to cotton cloths treated only with dilute solutions of sulfuric acid and corresponding solutions of caustic soda.

The effect of CO_2 absorbed from the air is well known to anyone who has had occasion to determine pH, and for this reason, the cell must be kept tightly stoppered during a test. A soda-lime tube, as shown in Fig. 2, is employed to remove CO_2 from air drawn in during cooling. Even the most careful precautions, however, do not entirely eliminate absorption of CO_2 and this fact is responsible, no doubt, for many of the small discrepancies in the obtained results.(1)

Not only CO_2, but Sulphur from the illuminating gas (used for heat in the extraction process) probably accounts for a false lower pH. This factor was eliminated to a great extent by use of an air condenser (Fig. 3) with a bulbous lower extremity which fits the mouth of the Erlenmeyer flask so that practically no gases are admitted during extraction.

The time required for obtaining equilibrium in the electrodes dipping in the quinhydrone-saturated solution was a difficult problem at first. The original tests were conducted leaving the gold-wire electrode exposed in the air in the interval between pH determinations. When the electrodes were dipped in the solution, the pH kept dropping steadily. It was thought best, on this account, to make the test as quickly as possible—but variations were inevitable. More stable results were obtained, eventually, by keeping the gold-wire electrode in a solution of quinhydrone (between tests) as shown in Fig. 4. Although this is not mentioned as a separate step in the standard procedure given below, it must be understood that this treatment was never omitted, because it had so much to do with the success of results. (2)

Other factors considered in the preliminary study were: (a) Amount of quinhydrone used in the cell. It was found that sufficient quinhydrone must be dissolved in the solution to about half saturate it. With solid quinhydrone, various amounts dissolved so that various resulted. The adoption of the acetone solution of quinhy-

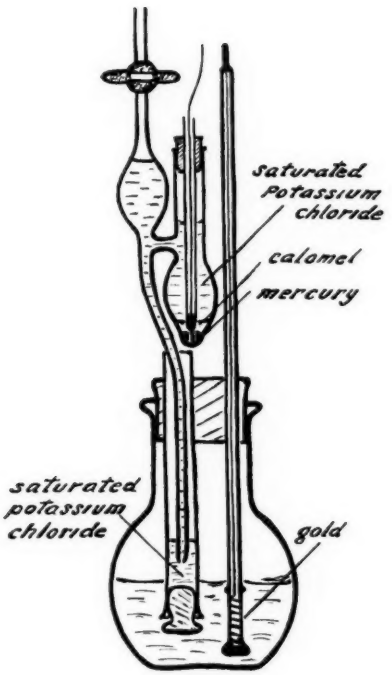

Fig. 1
pH Cell Designed by Dr. H. C. Chapin

drone and the standard addition of 25 drops largely eliminated this variable.

(b) Weight of sample. The effect of small differences in the weight of the sample proved practically negligible from tests on samples varying over 15% in weight.

(c) Volume of water used for extraction. This question was not satisfactorily settled due to lack of time, but it appeared from the few tests that were made that differences in the volume of the extract have a marked effect. It was decided to use 65cc of extract in the standard procedure.

The standard method of procedure finally decided upon includes the following steps:

1. All flasks, graduates, and other glass vessels are pretreated with boiling water; and rubber parts (stoppers, etc.) are boiled in caustic solution and treated as described.

2. Distilled water used for the extractions is taken from one source (a stoppered flask) in which it is kept boiling throughout the tests.

3. 75cc of distilled water is taken from the extraction of an approximate 2 gram sample of cotton cloth.

4. The water is poured from the graduate over the cloth in an Erlenmeyer flask and boiled under the air condenser for about ten minutes. See Fig. 3.

5. 65cc of the extract is measured off in a graduate and transferred to a 150cc extraction flask.

6. The flask is then stoppered, as shown in Fig. 2, with a thermometer and a soda-lime tube, and then placed under running water until the extract has cooled to 20°C.

7. At this point, the ground-glass stopper "e" (Fig. 4) is loosened to allow a drop of KCl to leak through from tube "d," and reinserted tightly and rinsed well with distilled water.

8. The calomel electrode is inserted into the KCl tube ("d") avoiding bubbles (which get caught at the glass joints and break the electric circuit).

9. The thermometer stopper of Fig. 2 is removed just long enough to add 25 drops of quinhydrone solution, then replaced and the flask is shaken with a rotary motion to stir up the extract and quinhydrone solution together.

10. The thermometer stopper is next quickly replaced by the electrode stopper (Fig. 1). The quinhydrone cell is thus complete as sketched in Fig. 1.

11. The potential wires are connected to the electrodes, the circuit button depressed, and a reading of potential obtained. (The wires are immediately disconnected and all parts of the apparatus touched by the test solution are thoroughly rinsed.)

12. The potential reading is converted to the corresponding pH value.

Although there may be opportunities for error in the above procedure, it was found that more uniform results were obtained by adhering to it strictly. The same errors, evidently, are introduced in every case and results are thus more nearly comparative. It was found, also, that consecutive tests could be run off in a series simultaneously. For instance, while the pH of sample No. 1 is being determined, the extract of sample No. 2 can be cooling under the tap, and sample No. 3 can be in the process of being extracted over the gas burner.

The determination of pH, as mentioned above, was restricted to samples treated in dilute solutions of sulfuric acid and caustic soda. Three solutions of each reagent were made up with normalities of 0.0001, 0.001, and 0.01 in each case. The samples were steeped in these solutions for thirty minutes, dried, and then extracted and tested for pH according to the standard pro-

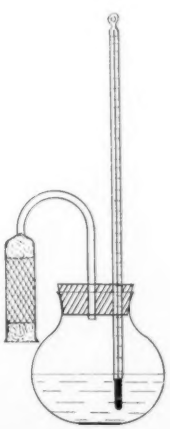

Fig. 2

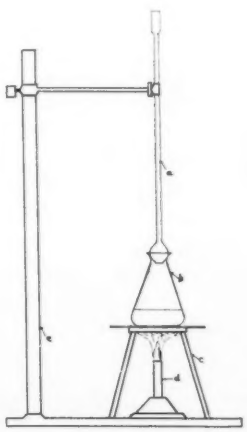

Fig. 3

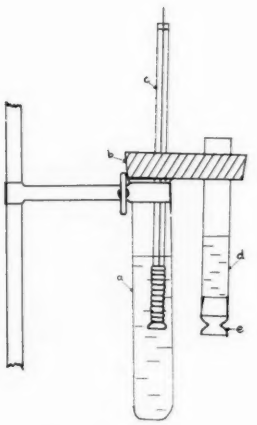

Fig. 4

cedure. Repeated extractions were made on the same samples to observe, if possible, how many are required to remove the acid for alkali entirely. From the graph of Fig. 5, it can be seen that the tendency of repeated boil-offs is toward a pH of 5.5 and the number of extractions necessary is proportional to the acid concentration in the cloth. Results with alkali-treated cloth appear more complicated and erratic as seen in Fig. 6. It shows, however, that the tendency of repeated boil-offs is toward a pH of 5.9; and that the number of extractions necessary is also dependent on the concentration of the alkali. The curious trend of the curves of the 0.0001 N and 0.001 N treated samples, in which the second extraction has a higher pH than the first cannot be accounted for unless one assumes that the errors are probably due to CO_2 absorption which is more marked in alkaline solutions. The fact, also, that the acid treated cloth assumed a boil-off objective of 5.5 pH and the alkali treated cloth a boil-off objective of 5.9 pH is also inexplicable, unless one takes into consideration the fact that samples treated with acids were not taken from the same piece as samples treated with alkalies (although both pieces were obtained from the same source and given identical treatment before being used). It may be that the cloth exerts a certain buffer-action on the solution, thus keeping it comparatively stable for the 0.0001 N and 0.001 N extractions, but losing its effect in the 0.01 N extractions, and also differing in results of different pieces.

At any rate the pH of the first extraction does not tell the whole story; but it can be applied in a comparative sense, that is, to indicate relative acidity or alkalinity. This is shown by the more or less uniform series reproduced in Table I from results of the experiments given before. Figure 7 shows the results graphically. Here it can be seen that increases in normality do not make proportional increases in effect on pH. Very little effect is shown by the 0.0001 N solutions, somewhat more by the 0.001 N solutions; but with the 0.01 N solutions much more marked increases are noted, especially in the case of the alkali solutions.

TABLE I

pH Values of the Extracts of Acid and Alkali-treated Cotton Cloth

Treatment	pH of Unheated Samples	pH of Heated Samples
0.01 N H_2SO_4	4.3	4.7
0.001 N H_2SO_4	5.1	5.1
0.0001 N H_2SO_4	5.4	5.7
Untreated Sample No. 1	5.6	5.8
Untreated Sample No. 2	5.7	5.7
0.0001 N NaOH	5.7	5.6
0.001 N NaOH	5.9	5.6
0.01 N NaOH	8.3	6.3

Both the figures in the third column of Table I and the dotted line curve of Fig. 7 would seem to indicate that the heat treatment lessens the effect on pH both in the acid-treated and alkali-treated samples. Comparison of the tensile strength effects of heat-treatment with those of non-heat-treatment indicates rather that heat treatment lowers the H_2SO_4 concentrations by reaction with the cloth while alkaline concentrations are probably affected by CO_2 from the air, thus lowering the tensile strength.

In making tensile strength tests to determine the effect of H_2SO_4 and NaOH, boiled out cotton cloth was used as a standard. Strip tests were made from cloth that had been treated with different normalities of H_2SO_4 and NaOH both before and after heating. The results of these tests are shown by graphs No. 8 and No. 9 in which the normality of the solution is plotted against the breaking strength of the cloth. It may easily be seen in graph No. 8 which is for the acid treatment, that without treating with heat the cloth is not much tendered by these dilute solutions. However, the graph of the heat treated sample shows a marked decrease in tensile strength as the strength of the acid is increased. This shows that the effect of even minute traces of acid in cloth will be quite damaging if the cloth is to be subjected to any subsequent heat treatments. This effect of acid on heated cloth has been studied to some extent in the laboratory of Cluett-

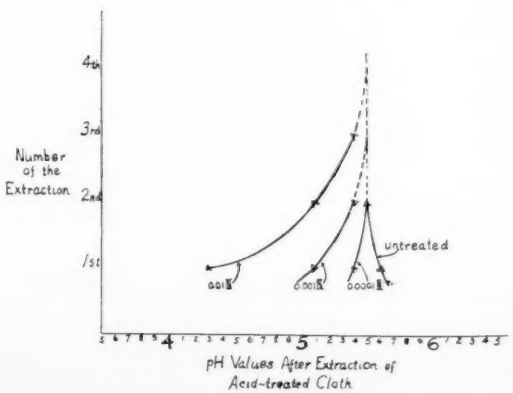

Fig. 5

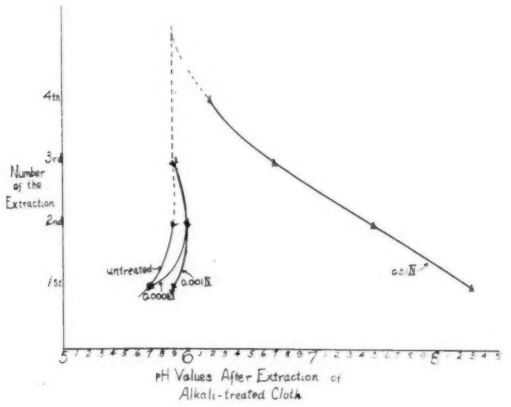

Fig. 6

Peabody Co., and it was found there that by using a temperature of approximately 200°C. very minute traces of acid could be detected. It is quite evident that even the amount of acid in the cloth could be determined in this manner with a fair degree of accuracy.

By treating alkali soaked samples in the same manner no such satisfactory results were obtained from the breaking strength tests. However, it was found that the amount of alkali in the cloth could be determined by the degree of discoloration after treatment with the hot iron. In any case, if a marked discoloration is produced at 200°C. with no loss in tensile strength it is almost certain that the cloth contains alkali.

In observing graph No. 9 for alkali treated cloth, it may easily be seen that heat has no great effect on the tensile strength, in fact the curves for the heated and unheated samples are almost parallel. From the graph it is evident that treatment with the correct normality of alkali (normality dependent upon the pH of the original cloth) would give the cloth a maximum tensile strength.

In conclusion it may be seen that in experimenting in the pH range between 4.3 and 8.2—as the pH of the cloth rises to 5.9, the tensile strength of the cloth increases. From 5.9 to 8.2 the tensile strength drops slightly, but it is still greater than the tensile strength of the standard. From Table No. 2 it may easily be seen that there is a certain pH which will give the cloth a maximum tensile strength. In this case the pH was 5.9.

TABLE 2

Cloth	Tensile Strength		pH	
	unheated	heated	unheated	heated
Standard	39.4 No.	34.1 No.	5.7	5.8
.01 N H_2SO_4	25.7 No.	2.2 No.	4.3	4.7
.001 N H_2SO_4	34.0 No.	21.3 No.	5.1	5.1
.0001 N H_2SO_4	36.8 No.	33.0 No.	5.4	5.7
.0001 N NaOH	40.8 No.	37.3 No.	5.7	5.6
.001 N NaOH	42.2 No.	39.5 No.	5.9	5.9
.01 N NaOH	41.8 No.	37.7 No.	8.2	6.3

It is also shown by Table No. 2 that as the pH of the cloth decreases below the standard, the cloth is greatly tendered. As the pH of the standard cloth increases, the strength of the cloth increases slowly. A cotton cloth having a pH of 4.3 is severely tendered, and if it has subsequent heat treatment it is nearly destroyed.

Experimental Data

In order to obtain as nearly comparative tests as possible, cotton cloth used for all the experiments was the bleached cotton cloth obtained from the same source. It was given a preliminary boil-off in a steam-jacketed iron kettle in distilled water for 30 minutes. It was then centrifuged (in a basket-type extractor), and hung in a drying chamber to dry. Samples for both the breaking strength and pH tests were cut from the same piece. The acid and alkali determinations were obtained from different pieces, however, because not enough of the materials to serve both series was first obtained. The second piece of cloth received identically the same preliminary treatment as the first.

1. *The pH Experiments*

The apparatus consists of:

1. A Leeds & Northrup portable potentiometer.
2. A Quinhydrone Cell (Fig. 1)—For the pH measurements we used a new type of cell, designed by Dr. H. C. Chapin for a private investigation, and described here with his permission. Though intended especially for poorly buffered solutions such as the water extracts on which we were working, it has certain advantages for general use.

   Its novelty lies chiefly in the calomel cell, which is supported by a pipette for saturated potassium chloride solution to which it is connected by a side arm. A glass cock at the top of the pipette facilitates filling and flushing, but being above the solution, outside the path of the current, it causes no trouble through seepage of potassium chloride, sticking, or open circuits from air bubbles.

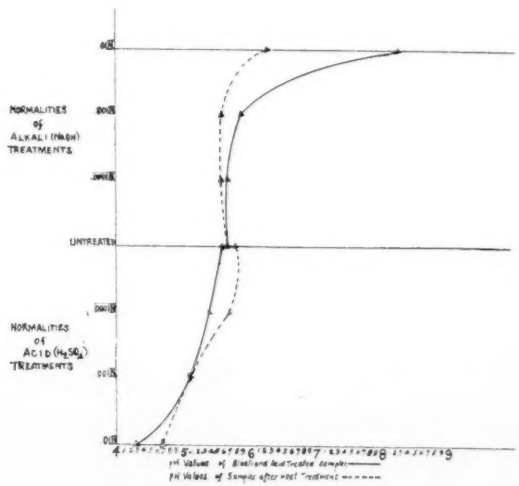

Fig. 7

This calomel cell is intended for use only with a salt bridge tube terminating at the bottom in a ground glass stopper. Preparing this tube for use by half filling with saturated potassium chloride solution, allowing solution to drip through ground joint until level inside will approximate subsequent level of sample in flask, and rinsing, one can get adequate electrical conductivity for potentiometric measurement without getting potassium chloride into the sample.

The entire assembly is sufficiently compact and symmetrical to stand by itself without additional support.

3. The extraction apparatus (Fig. 3), consisting of: an iron support (e), tripod and wire gauze (c), gas burner (d), Erlenmeyer flask (b), and air condenser (a).
4. The cooling apparatus (Fig. 2), consisting of: an extraction flask, a two-hole rubber stopper in which are fixed a goose-neck soda-lime tube and a Centigrade thermometer. Running tap water is sufficient for cooling. An iron support for holding the flask at an angle in a beaker under the open tap was used for this purpose.

In the preliminary study of variables, it was attempted to base all determinations on distilled water as a standard, but due to the unbuffered nature of such tests, large variations inevitably resulted. It is of course possible to obtain fairly constant values by extremely careful manipulation and use of more elegant apparatus for complete elimination of the CO_2 factor, but for the limits of this thesis, such slow work would be impracticable. A good average value for pH of distilled water obtained with the standard procedure is pH 5.7.

The first question attacked was the amount of quinhydrone necessary to saturate the test solution. Solid quinhydrone was originally used in lots of 0.1 gram; but the solid saturated the solution too slowly and results varied. For this reason, a saturated solution of quinhydrone in acetone was adopted, and applied by adding a certain number of drops to the test solution. How much of the solution of quinhydrone in acetone to use was then determined by a series of tests on distilled water. The procedure consisted of cooling 75cc of boiled distilled water in the extraction flask to 22°C, and then adding the various amounts of quinhydrone solution from a dropper (as quickly as possible). The results are given in table No. 3. In this table pH values are rather high due to the old form of electrode used. All later results had lower values, but these serve for comparison purposes. A standard of 20 drops was first adopted (after comparing the results of the experiment) but this amount was increased to 25 drops to insure increased saturation of the solution.

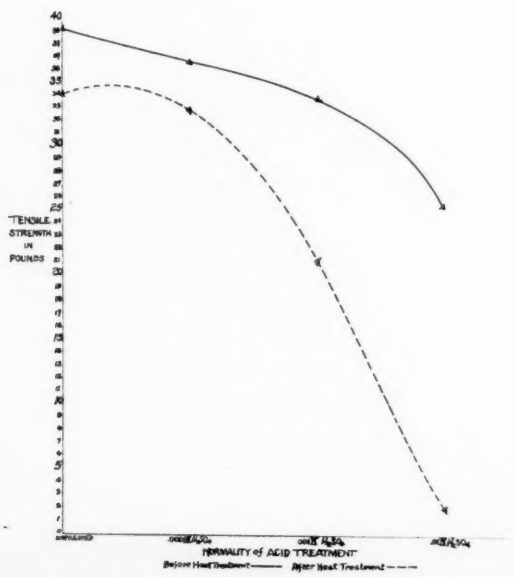

Fig. 8

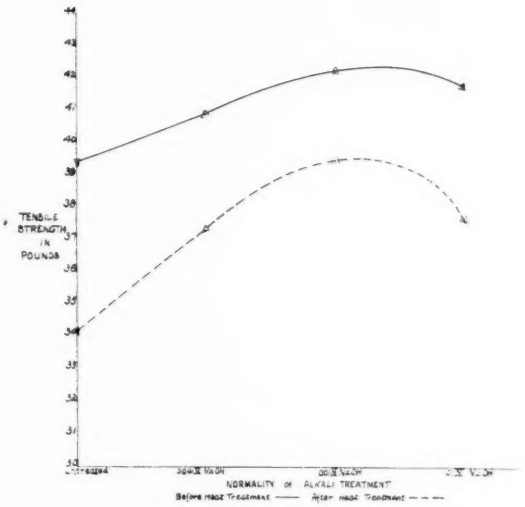

Fig. 9

TABLE 3

Test Number	Amount of Quinhydrone Solution	Resulting pH
1	5 drops	7.9
2	10 drops	7.1
3	15 drops	6.6
4	20 drops	6.7
5	30 drops	6.8
6	40 drops	6.8

The weight of sample offered the next problem. For convenience in size, samples of approximately 2 grams were used. To determine whether small differences in weight made a change in pH, samples weighing 1.67

(Continued on page 157)

Organized Resistance To Design Piracy

By WALDON FAWCETT

ORGANIZED resistance to the practice of borrowing, without permission, original, ornamental designs in manufactures has recently taken a new turn. At this advanced stage—belatedly, some observers would have us believe—the movement to safeguard one of the most valuable forms of industrial property has undergone radical realignment and redirection of effort. Henceforth, behold an attack upon existing evils from a quarter almost directly opposite to the previous approach.

Up to this time the campaign, of some years' duration, to secure more ample protection against the imitation or infringement of designs in industry has been concentrated upon an effort to secure remedial legislation from Congress. For a decade and a half, in one Congress after another there have been introduced various versions of a Bill which would undertake to give relief by transferring the authentication and certification of original designs from the U. S. Patent system to the copyright system. Persistence in this crusade brought reward in 1930 to the extent of formal approval of the Vestal Bill by the U. S. House of Representatives.

The fresh slant which has latterly been given to this quest for effective means of design monopoly is not, in any sense, unsympathetic to the idea of legal or legislative vindication. Indeed, the new expression found its inspiration, in part at least, in a desire to afford support to the Vestal Bill when, as approved by the House, it appeared before the U. S. Senate. Allowing for this contact with tradition, the new move is nevertheless a departure from precedent in that it undertakes, for one thing, the discouragement of design piracy ere that piracy has reached the stage for judicial interference, and for another thing, the provision of supplementary defenses in reinforcement of whatever protection the Federal law now affords or may hereafter afford.

The distinction to be drawn is, perhaps, symbolized by the change of title of the sponsoring organization. Years ago, when the issue was first joined, it was the Design Registration League, a body of textile manufacturers and other design-dependent interests, that took responsibility for the crusade. Today we have with us, instead, the League for the Suppression of Design Piracy, with membership open to individuals as well as firms and with a constructive purpose beyond the immediate objective—the passage of the Vestal Bill. Indeed, at the time that the rejuvenated League was organized it was suggested that the body continue in existence after the desired legislation was obtained in order to combat, as a group, instances of design piracy which operate against any of its members and thus to strengthen the law and make it effective.

In official circles at Washington the opinion is all but unanimous that support of this character from within the design-using industries will be imperative if and when design copyright legislation is obtained. This sentiment in executive and judicial quarters is logical because quite in line with prevailing thought at the capital. Washington is imbued with the thought that industry (all industries) must regulate itself and police itself. That theory is constantly finding practical expression. Say, in the Trade Practice Conferences conducted by the Federal Trade Commission to formulate codes of ethics for individual industries, and in the Simplification-In-Industry Conferences at the Department of Commerce destined for the negotiation of mutual agreements for restriction of commodity sizes, models, etc. Given this background and there has, naturally, presented itself to the official mind, the thought that the enforcement of proper respect for privacy in design is a job requiring teamplay as between Federal authority and the forces of industy.

This logic, on behalf of executives and jurists, might be applicable in the case of almost any industry confronted with confusion of property rights. In the case of the design-using industries there is, however, an additional persuasive influence. This is to be found in the factor of doubt as to the complete efficacy of the prospective design law. It is no treason to say that however much of an improvement a Design Copyright shelter may be over the limitations of Design Patent, there is yet lacking assurance that, in practice, its protective quality is wholly sufficient. The best friends of the Vestal Bill in the textile industries do not claim that it is all that could be desired. Indeed, readers with long memories may recall that, at the stage when the original draft was cut and patched in order to appease certain groups that desire to be free to follow fashion wherever it may lead, some of the pioneers in the design protective movement felt that the measure in Congress had been emasculated of its vital principle.

If the Vestal Act, when it comes, is to be a deterrent but not a complete cure for design piracy, it follows that aid will be necessary from non-governmental agencies. That in turn meshes with the Governmental idea that industry should, on all questions of morals, set its own house in order and keep it in order. There is another aspect of the expectation at Washington, that systematic organized effort in industry for design protection would, by suppression at the source, relieve appreciably the volume of actions in court for copyright infringement. This last is desirable in more ways than one. Not the least of these is the saving of time. Enrollment of designs under copyright should be expeditious compared with patent grants. But this speeding up process would not extend to the Federal courts when it was necessary for the owner of an invaded design to seek injunctive relief. Hence, the advantage of any preprotective arrangement that would retire infringing designs without a legal struggle.

Well-wishers at Washington of industry's efforts for higher standards of design sanctity, are inclined to believe that the textile industry has already found, in embryo, the best instrument for restriction of design piracy. The

endorsed vehicle is the private or group bureau for registration of designs. The formula has already been applied by the Silk Association in the case of fabric designs and by various other trade associations in respect to trade mark designs. It is obvious that the continuous operation of private registration machinery in a well organized industry must result in reduction to the minimum of cases of unconscious and unintentional design plagiarism. Presumably no interest could go into mass production unwarned that a design in hand had already been pre-empted by a fellow-member of the industry. Added to that is the restraint upon temptation to design piracy exercised by the danger of stigmatization before the entire industry. All of which supposes, of course, a participation as nearly as possible to 100 per cent of the strength of the industry which is cooperating for design regulation.

It has been suggested by experts at Commerce headquarters that realization of the complete ideal of a "design exchange" as an antidote for design piracy, may come only when there is a coordination of effort by various groups or trade associations having sympathy of design interests. The idea is that related industries which maintain files of designs for "search" and reference purposes might suitably arrange an interchange just as, in the field of international relations, Unions or Leagues of nations carry out circularization of copyrights, trade marks, etc., through central agencies located at Berne, Geneva, or elsewhere.

The vision at Washington contemplates an especial value for such clearing houses as might consolidate the design vigilance in a number of interdependent industries. Say the entire range of the apparel and dress accessory industries, where there are incentives to harmony of design in the finished products that are to be used in conjunction. Specialists who have hatched this idea hold that even if there was little to be gained, because of differences in mediums, by interchange of complete designs, the situation warrants the placing of allied industries on notice in respect to the prior adoption of distinctive design motifs which, if crowned with popularity, are apt to be translated into all complimentary industries.

In the current revision of arrangements no little significance attaches to the more active and more extensive participation of artists and designers. The American Union of Decorative Artists and Craftsmen was instrumental in the organization of the League for the suppression of Design Piracy. Working actively with the League are organizations such as the American Artists Professional League, American Association of Museums, American Federation of Arts, Art Directors Club, Artists Guild, Art in Trades Club, Federated Commercial Artists, Society of Illustrators and the several leading schools of design. The development by creators of a more sensitive composite conscience in respect to the evils of design piracy is doubtless the result in no small degree of the rise in dignity and remuneration of the profession of designer in America. At the same time it is a fair assumption that working artists and designers are in position to do much to discourage copying and further the cause of design integrity, both by sentry service at design sources and by evangelism in behalf of general, voluntary deference to a design—owner's right to the rewards of discovery.

Textile Chemical Firm Opens Offices

The Alexander Chemical Co., Inc., dealers in textile chemicals for dye houses and specializng in printing gums, recently opened offices in the Fair Lawn and Radburn Trust Co. Building, Paterson, N. J. W. P. Alexander is president.

The new company is sole agent for the Procter & Gamble Co., Cincinnati, in the metropolitan district, embracing New York and New Jersey. It is also broker for the Philadelphia Quartz Co., large silicate manufacturer, and the New York Color Co. It also represents a number of manufacturers of textile printing gums and chemicals.

Renew Textiles

Suggested uses for household textiles are included in the odd jobs campaign of the President's Emergency Committee for Employment, one of the largest national advertising campaigns launched in recent years. A series of four advertisements, to appear over the next few weeks, has been sent to a list of 2000 daily papers in all parts of the United States, urging readers to expedite construction and repair work within their own homes.

Widespread circulation is assured by the co-operation either of the newspapers themselves or of local citizens sponsoring the insertions. Speeches, radio talks, and other forms of advertising appeal will enter the program. Following up the movement through its many co-operating agencies, the committee is confident of a general response among those who can help relieve unemployment by giving odd jobs.

Under the caption "Put a Neighbor to Work," 100 typical jobs are listed, some of which, it is believed, should be applicable now to almost every house in the United States. Of the 61 suggestions which definitely indicate the use of materials rather than of services only, textiles and related products are included specifically in several instances and by inference in others. Readers of the advertisements are urged to re-upholster furniture, re-cover mattresses, lay linoleum and repair shades. A recommendation to install curtain rods connotes an opportunity for the renewal or addition of curtains and, similarly, other suggestions are shaped to create sales possibilities.

L. R. Gilbert, a graduate of the State College Textile School, Raleigh, N. C., has been appointed Textile Technologist with the Bureau of Standards, Washington, D. C. Mr. Gilbert is a former president of the Southern Textile Association, and for several years was superintendent of the Caraleigh Cotton Mills, Raleigh, N. C.

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

President
P. J. Wood
Oriental Silk Printing Co., Paterson, N. J.

Vice-Presidents
William H. Cady—H. A. Barnes

Treasurer
Harry R. Davies

Secretary
Alex Morrison
American Woolen Co., Andover, Mass.

Councilors
Ralph F. Culver — George A. Moran
H. M. Chase — Hugh Christison
William R. Moorhouse — Walter M. Scott

President Emeritus and Chairman of the Research Committee
Louis A. Olney
Lowell Textile Institute, Lowell, Mass.

Local Sections and Their Officers

Northern New England Section—
Henry D. Grimes, Chairman, Wood Worsted Mills, Lawrence, Mass.
Harold C. Chapin, Secretary, Lowell Textile Institute, Lowell, Mass.

Rhode Island Section—
Dr. D. H. Powers, Chairman, U. S. Finishing Co., 389 Charles St., Providence, R. I.
A. Newton Graves, Secretary, Franklin Process Co., Providence, R. I.

New York Section—
Robert H. Gaede, Chairman, Gaede Silk Dyeing Co., Paterson, N. J.
Clemens F. Hoppe, Secretary, Oriental Silk Printing Co., Haledon, N. J.

Philadelphia Section—
Charles A. Seibert, 311 S. Riverside Walk, Penn's Grove, N. J.
Percival Theel, Secretary, Philadelphia Textile School, Philadelphia, Pa.

Piedmont Section—
Samuel L. Hayes, Hartsville Print & Dye Works, Hartsville, S. C.
Arthur R. Thompson, Jr., Secretary, 1109 Independence Building, Charlotte, N. C.

South-Central Section—
R. S. Wheeler, Chairman, Crystal Springs Bleachery, Chickamauga, Georgia.
J. D. Mosheim, Secretary, Crystal Springs Bleachery, Chickamauga, Ga.

Midwest Section—
Edward W. Morgan, Chairman, Morgan Dyeing & Bleaching Co., Rochelle, Ill.
William Bergh, Jr., Secretary, Vassar Swiss Underwear Co., Chicago, Ill.

Lowell Textile Junior Section—
Alfred J. Carbone, Chairman; Paul Duggan, Secretary.

North Carolina State College Junior Section—
R. A. Gilliam, Chairman E. B. Hardin, Secretary.

CALENDAR OF COMING EVENTS

Council and Research Committees—
March 20—Boston.
April 10—New York.
May 15—Boston.

* * *

Exhibition of Color at the Museum of the Peaceful Arts, 220 East 42nd Street, New York. Starts January 2nd and continues several months.

* * *

New York Section Meetings—
March 27—Paterson.
April 24—New York.
May 22—Paterson.

* * *

Northern New England Section Meetings—
March 7.
April 4.
May 2.

JANUARY MEETING OF NEW YORK SECTION

THE January Meeting of the New York Section of the American Association of Textile Chemists and Colorists convened Friday, January 23, 1931, at 8:15 P. M., at the Alexander Hamilton Hotel, Paterson, New Jersey, Henry F. Herrmann, Vice-Chairman of the Section, presiding.

Chairman Herrmann: Might I suggest that you gentlemen just arrange yourselves so everybody can see and hear and be perfectly comfortable?

. . . The routine business of the Section was transacted . . .

Chairman Herrmann: I don't have to tell you gentlemen that our Chairman is away this evening. He called me up early this afternoon and told me that he was ill and wouldn't be able to attend and he asked me to perform a service which I know he would very much like to have performed himself and which he is more competent to do than I, at least he has had a little more preparation for it.

As the announcement says this is the first meeting following the general election. As such we felt that it was no more than fitting and right that the Section should give some expression to the pleasure and the honor that has come to it in the election of one of its members to the presidency of the National Association.

Gentlemen, many of you have traveled farther than I have. I have traveled enough to appreciate that this is a large country. We can race on trains for days and nights to span its width. We can race for days and nights to span it from North to South. Throughout its course there is industry, mill after mill, every mill typifying energetic ambitious organizations, ambitious chemists, ambitious superintendents, young men, middle-aged men, old men, all struggling to get ahead.

In a sense I like to picture our organization as a national one with its members, whether they are active or only semi-active, scattered throughout the country. And I hold that leadership in any national organization, whether it be ours, engineering, music, art, or what have you, is a great credit and it points to a great man. Just because the talent happens to be in our own midst let us not overlook it. We consider that the leader of this national organization is a man worthy of the honor and it is a pleasure for us to greet him, and to acknowledge what we consider to be an honor justly given to him.

Some of us who started with the organization way back at its inception recall the handful of pioneers who got together in the pre-charter days when all of this was just an idea, in fact, a half-formed idea, opposed by many people, supported by few, with no financial assistance, and Mr. Wood was among the first. The New York Section as it stands today, I might say, is largely a tribute to his untiring, unselfish efforts. The Section through its various chairmanships, elected officials, appointive committees (I know I can truthfully say this for the few little jobs I have held) leaned rather heavily upon the gentleman who has honored our chair here for several terms and who has always been active among us. We have leaned upon him. We have depended upon his influence, upon his kindly counsel, his guidance, and I am very glad to see that his ability in this direction, as typified, I might say with a certain degree of pride, by this large turnout is going to also strike the national organization.

If I may be allowed to brag just a little more about ourselves, we have had two presidents in succession. I am very sorry that Dr. Killheffer isn't here tonight. Maybe he wouldn't mind us being so proud that he also belongs to this Section.

Mr. Wood, let me express to you personally in the presence of your friends, here, our kindest wishes and most hearty congratulations. We wish you godspeed in this high office and we know from some of the programs that are in the wind—our co-operation with National Research Council and the like—that we will depend very, very much on you for your guidance and for your firm hand at the helm.

Gentlemen, will you join me in rising and applauding our President? (The members arose and applauded.)

President Wood: Mr. Chairman and Gentlemen: As I listened to the very generous remarks of our Chairman I made a resolve and that resolve is that when it comes time for my obituary to be written, Henry Herrmann is going to write it. (Laughter) However, may I express the hope that we will both be old men by that time? I am sure no one could do it more ably.

It is a great pleasure to me to stand here a member of the New York Section and to realize the great honor that you and the other sections of our great national organization have conferred upon me. I realize also that it means a great deal of work, as probably you do, and that work I will not shirk. I only hope that I may have the strength and the ability to prove a worthy successor to the two splendid presidents who have preceded me.

I should like to say a word to all of you as members of this great national organization with regard to your part in our work.

Last night I attended a very interesting meeting in the Y. M. C. A. which was called with the idea of forming an executives' club. It was interesting from the point of view of the speakers present and also from the point of view of the men representing the industries of Paterson district who were there.

We had there a man from the Hackensack Executives' and Foremen's Club who told us a great deal about the work that was carried on in Bergen County. Amongst other things he said that their motto was, "Information, Inspiration, and Fellowship." And I think these three words would form a very splendid motto for our national organization. I hope that the New York Section will take these three words and remember and apply them in the life of our Section.

It is very nice to be able to have speakers come to us as we do, competent speakers, such as we have tonight, who can give us information, who can give us inspiration. It is very nice to get together and meet one another in fellowship. That is one of the outstanding characteristics of several of our business clubs of today and particularly I think of the Rotary Club of which I have the honor to be a member. I know that through the contacts I have made here and in the Rotary Club and similar organizations I have made friends who have been valuable to me not for the sake of what I have been able to get from them but just from the fact that I have had fellowship with them.

I think if we would practice this motto in all its three phases—information, inspiration, and fellowship—we would be able to do away with a lot of inflammation, perspiration and bellyaching. (Laughter and applause.)

We need courage to carry on an organization of this sort. Particularly we need courage when things appear to be flagging.

Our Chairman was kind enough to give a great deal of credit to me for my early efforts on behalf of this Sec-

tion. We had a very small gathering that first night we met at the Pennsylvania Hotel. The number was as the newspapers say "small but enthusiastic," and I think the main pastime of the evening was telling stories. (Laughter.) Of course, we have progressed a great deal beyond that.

We need a great deal of courage and we need the co-operation of every member. It isn't sufficient to lean on one or two of the stronger members who of their own initiative go out and carry on the work of the Section. We need the co-operation of every member.

How very rarely has your Program Committee received suggestions from the membership of the Section regarding possible speakers? Keep this in mind, men. There is where you can shine.

How very rarely have we had anybody volunteer to give a paper? Of course I realize sometimes some of us are rather limited by our business connections as to just how far we can go in this direction but I think if we cudgel our minds a little bit we can think of something interesting, something which would be interesting to all the members from a general point of view without revealing any (I will say it) so-called trade secrets, of which I think there are very few. (Laughter.)

I think many of us are fearful of too many little things of that sort. We are something like the old Englishman who used to after supper go over to a certain cafe on Railroad Avenue and at seven o'clock, right after supper, he would order a mixed ale. He would sit down in the corner, read his paper until nine o'clock, then he would step up to the bar and order one more mixed ale, drink that, and go home to bed.

One evening he was drinking his first mixed ale, and about eight o'clock in came one of these fancy New York johnnies in a terrible hurry. He went up to the bartender and said, "Give me a Poose Cafe."

The bartender mixed a little of this and a little of that and a little of that in a long thin glass. The man drank it and went away.

The old chap kept thinking to himself, "Poose Cafe! Poose Cafe!"

Nine o'clock arrived and he went up to the bar. He said to the bartender, "Give me a Poose Cafe."

The bartender said, "What?"

He said, "Give me a mixed ale damn quick. It is time to go home." (Laughter.)

I think too many of us are scared off by a harsh word of that sort or by the thought of something which may never happen. So I would ask you all to please not depend entirely on your committees and to see if there isn't something that you personally can do for your Association.

I think if I were to ask each one of you individually you would admit that you enjoy these meetings. The very fact that you are here is evidence enough that you do enjoy the meetings. Your committee works hard to make them enjoyable and to make them interesting. If they don't always succeed that isn't their fault. They are always acting in good faith.

So please try from now on to do your share to support the men who have so nobly supported you during the past years.

Thank you. (Applause.)

Chairman Herrmann: Gentlemen, let us proceed with the technical part of our meeting.

It becomes my pleasure to introduce Mr. Von Bergen, Chemist of Forstmann & Huffmann Co. From all I gather he is a very competent and expert chemist in his field. The title of his paper is, "New Kinks in Wool Dyeing." I think Mr. Von Bergen has a few slides to show and if it doesn't cause too much inconvenience I would ask you gentlemen to kindly cooperate with the person who is going to manipulate the lantern.

Mr. Von Bergen! (Applause.)

Mr. W. Von Bergen presented his prepared paper. (Applause.)

Chairman Herrmann: Gentlemen, in order that we can give the second speaker plenty of time I am going to pass over the usual discussion period and suggest that anyone who may have questions to ask Mr. Von Bergen do it more or less in a personal manner after the meeting adjourns. We do that only in order to conserve time. I am sure Mr. Von Bergen would be delighted to answer any questions that you may have to ask him.

It now gives me great pleasure to introduce our second technical speaker, Mr. K. L. Schanbacher, of the Technical Staff of the Victor Chemical Company, who will speak to us on, "The Use of Formic Acid in Textile Processing."

Mr. Schanbacher! (Applause.)

Mr. Schanbacher presented his prepared paper at the conclusion of which he made the following extemporaneous remarks:

Mr. Schanbacher: If you gentlemen have any questions you wish to ask me I have with me a practical man who has been in the dye-house for years and who is fairly well acquainted with formic acid in particular in wool dyeing. He has some samples with him. If you should have questions, he may have samples here that will answer such questions as you have, that is, questions of a practical nature. (Applause.)

Chairman Herrmann: I will abide by the original decision that, much as we regret it, we will have to defer a formal discussion of these two very excellent papers. This is only in the interest of economy of time. I trust that any of you who have questions will avail yourselves of the kind invitation of the two speakers to present them personally after the meeting has adjourned.

The Chair will now entertain a motion for a rising vote of thanks not only to the two speakers but also for the kind services of our friend, Mr. Wiehl, who is responsible for this very pleasant evening.

The motion was duly seconded and carried. (Applause.)

Chairman Herrmann: The meeting stands adjourned.

The meeting thereupon adjourned at nine fifty-five o'clock.

Formic Acid in the Textile Industry

By K. L. SCHANBACHER
Victor Chemical Co.

AT the request of your committee it is my pleasure to address you on the subject of "Formic Acid In the Textile Industry."

As you no doubt know, this subject covers a multitude of sins and is one that is of growing interest to the dyer. I personally have no special qualifications to speak on this subject other than the experience and information which I obtained in marketing and developing the use of this product during the past two years.

Before taking up the technical application of Formic Acid it might be well to sketch briefly its history and economic aspects. Formic Acid was known as early as the Seventeenth Century and was discovered by distilling red ants with water. Incidentally, the sting of bees and other insects is due to the presence of this acid in their fluid. The various processes by which Formic Acid has been manufactured are too numerous to discuss, but when it came into commercial importance it was generally produced by the Synthetic Method. In a general way the process consists of heating Sodium Hydroxide or Caustic Soda under pressure and in the presence of Carbon Monoxide which gas is obtained either as a by-product from blast furnace operations or from producer gas ovens. The product of the reaction of these two compounds is a salt known as Sodium Formate which is the basis of manufacture for Formic Acid. In order to obtain Formic Acid, the Sodium Formate is treated with Sulphuric Acid which liberates Formic Acid and Sodium Sulphate. At this stage the Formic Acid is still very impure and must be extensively treated in order to obtain the very high quality and uniformity demanded by the present day consumer.

Formic Acid has been known and used for a long time in Europe. In fact, in France and Germany Formic Acid is used almost as extensively as Acetic Acid and is being produced there on an enormous scale. Numerous attempts were made in this country to produce Formic Acid the first of which was several years prior to the World War. During the war the only manufacturer in this country discontinued his operations which were never resumed. At that time several companies attempted to produce Formic Acid, but their production costs were such that they could not compete with the imported material that flooded the market after the war and consequently were forced to discontinue its manufacture shortly after the signing of the Armistice. By 1920 conditions were such that one of the large chemical manufacturers was induced to enter the field. They produced it in a small way for some time. However, in 1922 the Tariff Protection on Formic Acid was removed and Foreign importations soon flooded the market at prices much below American production costs with the result that this firm had to discontinue its operations. Incidentally, it is interesting to note that as soon as the foreigner had killed off American competition the prices of Formic Acid were raised up to and above the level they enjoyed when the emergency Tariff Act of 1921 was in effect. There followed a period of six years during which all material used in this country was of foreign origin.

Finally, in 1928 the same American producer again entered the field followed soon thereafter by another manufacturer so that today we have two large chemical companies manufacturing this material assuring the consumer of a reliable source of supply and a product of the very highest quality.

Another interesting observation is that in 1928 when both of these companies started the manufacture of Formic Acid an ad valorem duty of 25% or approximately one and seven-tenth cents per pound was in effect. This duty was changed by the recent Tariff Act of 1930 to 3c per pound. In spite of this increase in Tariff there has been no rise in the Formic Acid market. In fact, there have been reductions. I mention this to show that the domestic producers are not interested in getting merely all that the market will bear but are sincerely interested in promoting the use of Formic Acid in the textile industry.

Domestic Formic Acid is today obtainable in two concentrations, viz. 85% and 90% strengths. In the old days it could be obtained in almost any concentration from 32% to 85% much to the disgust of the dyers. The only reason for the 85% concentration is that it is a hang over from the days of foreign competition. It seems that in the early days of Formic Acid in this country the foreigner educated the trade to 85% strength and, of course, they still demand this concentration. However, it is quite obvious that the 90% Acid is more desirable: First, because of the saving in freight and secondly because of the saving on the handling of 5% less water. In the following any figures given are based on an Acid of 90% strength:

Formic Acid is used in the dye bath in much the same way as Acetic and Sulphuric Acids and it is with these

two Acids that Formic Acid must compete and against which it must demonstrate its superior qualities. In order that we may have a better understanding of how Formic Acid fits into the picture let me call your attention to the fact that it lies between Acetic and Sulphuric Acids in acid strength. In other words, it is one of the strongest organic acids much stronger than Acetic acid and about the same in exhausting power as Sulphuric Acid. For instance, exhaustion tests were made with 2% Orange G.G. using this percentage in each case and the ratios found were 7% Sulfuric, 8% Formic and 33% Acetic.

I feel sure that most dyers will agree with me that there have been times when they sincerely wished for some Acid having the advantages of Acetic combined with some of the economy of Sulphuric Acid, particularly in these days of extreme competition where the demand is always for a higher quality at a lower cost. To the best of my knowledge, Formic Acid comes nearer to fulfilling these requirements than any other acid. However, before going any further, I wish to make myself perfectly clear on this point: Formic Acid is not a panacea for all the dyers' ills nor can it supplant Acetic or Sulphuric Acids equally well in all processes, but rather the point I wish to bring out is that there are beyond doubt numerous places in which the dyer can use Formic Acid with greater economy and better results where he is now using other acids.

Another thing to bear in mind is, that no two dyers work under identically the same condition with the result that it is only possible to give a general outline of the various uses and methods of application of Formic Acid.

Acetic Acid being the most widely used Acid we will use it as a basis of comparison in arriving at the dyeing strength of Formic Acid and in this respect it has been found in practice that with the average acid colors the ratio of 1 lb. of 90 per cent Formic Acid is equal to 8 lb. of 28 per cent Acetic or 4 lb. of 56 per cent Acetic. This ratio is not a fixed and firm thing and is subject to slight variations depending upon the colors and other conditions. From the above ratio it is quite apparent that Formic Acid is more economical than Acetic Acid. Taking the present day average price of Formic Acid at 11c per lb. and 28 per cent Acetic at 2½c per lb. we find that 1 lb. of 90 per cent Formic Acid at 11c per lb. can supplant 8 lb. of 28 per cent Acetic Acid costing 20c, a saving of over ½c per lb. on every pound of 28 per cent Acetic Acid supplanted by Formic Acid. The figures given are those obtained in actual dye house practice and can be proved by a little experimentation on the dyer's part. So much for the economy of Formic Acid.

The next and most important consideration is the quality of work it produces. There are two conditions that every dyer aims to obtain. Level shades and soft easily wound skeins. For level dyeing on most types of yarns and pieces Formic Acid gives excellent results with the average run of Acid colors. If Acetic Acid is used the exhaustion is incomplete unless a very high percentage of Acid is used. This generally increases the cost beyond the allowed rate. Even then to obtain a shade which will look well covered and penetrated, a stronger acid must be used. If Sulphuric Acid is used after partial exhaustion with Acetic Acid it may exhaust the bath too quickly and force all the dye on the outside of the fibre. Prolonged boiling is then necessary for proper levelness and penetration. This may also cause the shade to boil duller and heavier resulting in a poor match or a rejected lot. If the lot is started carefully with Formic Acid and exhaustion completed by well diluted additions, as a general rule the lot will be finished quicker, the shade will be brighter and fuller and the exhaustion accomplished more economically than if a combination of Acetic and Sulphuric Acids are used. In the case of yarns a swelling action takes place and makes the skeins fluffier and softer to the feel.

As you know, dyes can be divided into three general classifications: namely, very sensitive, moderately sensitive and insensitive. For the very sensitive colors Acetic Acid is undoubtedly the best medium. However, there are a wide range of colors that come under the classifications of moderately sensitive and insensitive on which Formic Acid can be used to best advantage. The reason for this being that Formic is a stronger acid and gives a more complete exhaustion of the dye bath yet is not so strong that the colors will jump resulting in unevenness.

Another virtue of Formic Acid is that the penetration will be quicker and more uniform. This is due to two factors viz., the greater strength of the Acid and because Formic Acid has the unique characteristic of having the properties of an aldehyde besides those of an acid. This is due to the fact that the Aldehyde group is contained within Formic Acid molecule. It seems that the Aldehyde group within the Formic Acid molecule has the peculiar property of swelling animal fibre. From the preceding it can be generally stated that the average moderately sensitive color can be dyed to better advantage with Formic Acid because of greater levelness and better penetration. Should there be any question in the dyer's mind of how a particular color will take using Formic Acid it is suggested that he feed the Acid on gradually. In this manner obtaining the same effect at the beginning of the bath as when using a weak Acetic Acid solution.

It often happens that the dyer wishes to use a combination of colors calling for a very sensitive and a moderately sensitive dye. In such cases Formic Acid fits in beautifully. Acetic Acid is used at the beginning of the bath to put on a senstive color and followed with gradual

addition of Formic Acid to put on an insensitive color. Here the advantage over Sulphuric Acid as the secondary acid lies in the fact that should there be any of the sensitive dye left in the bath the Formic Acid is not so strong that it will cause it to jump on the fabric with resulting unevenness. Also when using Sulphuric Acid in such a combination of colors it is very difficult to obtain proper penetration. In order to obtain a penetration of proper levelness with a mineral acid it is necessary to keep the bath at a boil a long time which is not so very desirable, or use excessive quantities of Glauber Salts which although cheap, is an added expense, and then on drying the material one can never be positive that it will not show the tendering effect of a strong mineral acid.

Recently there has been a great demand for a mixture of wool, rayon and cotton where the cotton or rayon is left white and the wool is dyed. These are known as silvertone combinations. Where Acetic Acid is used as the exhausting agent the rayon or cotton is generally stained slightly or heavily depending on the types of dyes and the percentage of Acetic Acid used. Some dyers have finished their dyeing by feeding on vitriol at the end of the operation. This can be used with little danger of harming the cotton or rayon providing one or two thorough washes are given at the end. This worry and extra work is entirely eliminated when Formic Acid is used. The goods can be taken from the dye bath and dried hot, if necessary, and no tendering action will take place. The Formic Acid is volatile and as the moisture is dried off Formic Acid is carried with it. In the case of Sulphuric Acid there is an increase of percentage of acid as the moisture is driven off resulting in complete carbonization of the vegetable fibres where washing was neglected.

Recalling the swelling effect of Formic Acid on the animal fibres it is this same characteristic of Formic Acid that makes it a valuable scrooping agent and in this connection has found favor with many dyers. It is as efficient as either Tartaric or Citric Acids and has the advantage of being considerably lower in cost. The usual practice of scrooping is to run the dyed lot into a warm bath containing soap, then transferring the lot into a cold bath containing 1 to 2 or even 3 per cent of Formic Acid, leaving this run for about 15 minutes after which the material is removed and follows the ordinary procedure. No washing off is required.

One of the most important uses for Formic Acid is in Chrome dyeing. The advantage of using this material in this process again lies in the fact that it has a swelling effect on the fibre and is a strong reducing agent. Its reducing action combined with the swelling effect makes it possible to use less Chrome in the fixation of the color and to accomplish this operation in a shorter length of time than with either Acetic, Sulphuric Acid or Argols. Here again a very substantial saving can be effected, both in the amounts of acid used and in the reduced amounts of chrome required, not to mention the elimination of Argols from the formula. When using Formic Acid there is a distinct advantage over the tartar process because practical tests have shown that the use of tartar is accompanied with a harsh wool.

It might be of interest here to describe some tests made in the Chroming Department of a very large woolen mill. In this Chroming Department they had a large number of hussongs and were using approximately the following formula: 20 pints Acetic Acid 56 per cent concentration, 8 pints Vitrol, 5 pounds of crude grade Argols and 10 pounds Chrome. The type of the material was woolen raw stock. In order to make the comparison as accurately and fairly as possible two machines were selected; one of which they ran their method and the other was turned over to us. Our formula called for 4 pints of 90 per cent Formic Acid, 2 pints Vitrol and 5 pounds Chrome. In their procedure they added the total quantity of Acetic after the bath had reached 100° F. We added 4 pints of well-diluted Formic Acid at the same temperature, the bath was brought to the boil and boiled for 20 minutes after which time 2 pints of well diluted Vitrol was added. Boiling was continued for 15 minutes and then 5 pounds of Chrome was added. The lot then was boiled for ½ hour longer and plugged.

We cut our length of time in the entire run from 2 hours 15 minutes to 1 hour 45 minutes which in a large dye house is of considerable value in itself. Representative samples were taken of the two batches and a perfect match was obtained. I brought along with me samples of the run described, which I will be only too glad to pass around so that you can draw your own conclusions as to quality of material turned out.

From the standpoint of economies effected the important thing to observe is the substantially reduced amounts of Chrome used. In this particular case one-half the amount that was used when Acetic Acid had been employed. Another saving effected was the elimination of Argols not to mention the reduced Acid costs. Basing the figures on the price then in effect, a saving of almost 50 per cent was effected with the same quality of workmanship, if not better. You have no doubt noticed that we omitted Cream of Tartar entirely in our procedure because when using Formic Acid it gives the reducing action which the cream of tartar is supposed to perform.

Of course, other woolen plants may use different procedures wherein the saving effected would not be as great as in this particular case. However, I sincerely believe that in most cases at least a 10 to 20 per cent saving could be effected.

Formic Acid can also be used to excellent advantage in cross dyeing. Many fabrics are made of cotton and worsted, the cotton being dyed in the skein and then

woven with the white worsted which must be dyed differently and usually in a brighter shade. In numerous instances in this type of work vat and developed colors are used. Due to the lower cost of developed colors they are preferred to the vats. It has been found that the longer the colored cotton is boiled in the presence of wool in an Acid bath the lighter the shade of the cotton will be. This in turn tints the worsted material and prevents the production of clear bright colors.

Formic Acid as you know is a much faster exhausting agent than Acetic with the result that when using Formic on this type of work brighter and clearer colors are obtained. If Sulphuric Acid is used it will thin the shade much quicker than Formic Acid and might have a harmful effect on the cotton fibre.

Where colored pieces which have been dyed with regular acid colors are fulled with soaps it often happens that the alkali present neutralizes the acid contained in the yarn which is holding the dye to the fibre. This results in bleeding of the color and in some instances a complete change of shade. Occasionally if pieces of different shades are being fulled at the same time the dye released by the alkali stains the other shades present and causes unexpected difficulties. If these same pieces are fulled with Formic Acid at the rate of 2 per cent to 3 per cent diluted with water, the colors will not bleed off and will remain clear and bright. A light fulling can also be accomplished quicker with Formic than it can with soaps. This is probably due to the Formic Acid swelling the fibres and making them stick out and become attached to other fibres as they are forced through the fulling mill. Due to the present demand for a low priced cloth that will feel as thick and full in body as the higher priced fabrics, many manufacturers are making their cloth from low grade yarns and then fulling to give the cloth the required body. Another advantage of fulling with Formic Acid instead of soap is that it eliminates all danger of the formation of insoluble calcium or magnesium soaps due to hardness of the water.

There is still another use for Formic Acid which is being developed in this country at the present time and which is at present used in Switzerland with great success viz: as a wash before tin weighting. In this process the material is washed before tinning in a slight concentration of Formic Acid, the idea being that the Formic swells the fibres and makes the penetration of the tin much easier and quicker. It is claimed that instead of having to give the skein three dips it can be tinned with one dip. The exact details of this process are not in my possession, and as far as I know this process is merely in the experimental stages in this country. However, there are several companies that are trying to develop it and it is no doubt merely a question of time until detailed information on this process will be available.

So far, I have confined myself chiefly to wool dyeing mainly because it lends itself best for comparative purposes. However, in the silk dyeing industry Formic Acid finds practically the same uses as in the woolen industry. Naturally slight modifications have to be made and generally it is necessary to use slightly higher concentrations of Formic Acid than in wool dyeing. In silk dyeing, when the dyes are exhausted with Formic Acid they go on more slowly than when either Sulphuric or Acetic Acids are used. It has been found that the exhaustion is better and consequently the usual after washes are reduced to a minimum. This in itself is a decided economy not to mention the usual saving in acid cost effected by the use of Formic Acid.

From the foregoing the outstanding points to remember when using Formic Acid are that it is an Acid stronger than Acetic and about on a par with Sulphuric Acid, and that it has swelling and also reducing properties. To the dyer interested in Formic Acid it cannot be too strongly recommended that he experiment with this Acid in order to adapt it to his own particular needs and that while he is experimenting with this acid he forget the prejudices and inhibitions that characterize the textile field to-day. In other words, to give the Acid a fair chance.

In conclusion, let me again point out that I do not claim that Formic Acid is a cure-all nor can it hope to replace Acetic or Sulphuric Acids in all instances, but I do claim that Formic Acid is one of the many neglected chemicals and can be used to a much greater extent than it is at present with a decided saving and higher grade of workmanship than is obtained by present-day methods.

JANUARY MEETING OF THE RHODE ISLAND SECTION

THE January meeting of the Rhode Island Section of the American Association of Textile Chemists and Colorists was held on Friday evening, January 30, 1931, in the rooms of the Providence Engineering Society.

The following officers were elected for the year 1931:

Donald H. Powers, Chairman
A. Newton Graves, Secretary
Ben Verity, Treasurer

SECTIONAL COMMITTEE
Henri N. F. Schaeffer
Morrell Mackenzie
John G. Masson
Leslie L. Bamberger

Brian Wainwright, of Slater & Company, gave an interesting talk entitled "English Print Works."

About sixty members were present.

Respectfully submitted,
A. NEWTON GRAVES, *Secretary.*

WINTER MEETING OF THE PIEDMONT SECTION

THE Piedmont Section of the American Association of Textile Chemists and Colorists held their regular Winter Meeting on January 31, 1931, at the O'Henry Hotel in Greensboro, N. C. The banquet was followed by a very interesting program.

Hill Hunter, purchasing agent for the Proximity Manufacturing Company, Greensboro, N. C., made an address on "Purchasing for Textile Mills and Some Commercial Aspects of Same."

Rev. A. B. Conrad, High Point, N. C., made a big hit with the members of the Section in his address on "Contacts."

D. O. Gryder, of the Southern Dyeing Company, Burlington, N. C., presented a paper entitled, "Dyeing of Rayon Yarns." Mr. Gryder's paper brought out many new and interesting facts about the irregularity often encountered in dyeing rayon yarns and his paper was thoroughly enjoyed by all members present.

A symposium was held on the following subjects:

No. 1—Describe a simple test for the solubility of sulphur dyestuffs for use in packages and beam machines.

No. 2—What differences in results can be expected and how do costs compare when using the following chemicals for "souring" agents after bleaching cotton goods with "Chlorine," Sulphuric Acid, Oil of Vitriol, Bisulphite of Soda, "Hypo" and Sulphur Dioxide?

No. 3—Can Naphthol Red be successfully dyed on raw stock?

At the business meeting, the following members were appointed to the Sectional Committee:

R. M. Mitchell, Greensboro, N. C.

S. I. Parker, Hartsville, S. C.

Malcolm MacKenzie, Charlotte, N. C.

The question of holding the Fall meeting at Greenville in 1932 was tabled with the recommendation that it be taken up by the new officers elected in the Fall of 1931.

The Section approved and confirmed the invitation to hold the National Annual Meeting with the Piedmont Section in 1932. The Secretary was instructed to confirm this invitation at once. The exact meeting place was left open to be decided later. An invitation was made to hold the meeting in Charlotte, but it is expected that other cities will also extend invitations for the 1932 Annual National Meeting.

Chairman Hayes appointed the following Membership Committee:

Hugh Puckett, Charlotte, N. C.

A. H. Grimshaw, Raleigh, N. C.

Joe E. Moore, Charlotte, N. C.

John Cosby, Greenville, S. C.

H. A. Barnes, newly elected Vice-President of the National Association, expresses his appreciation for the honor recently conferred on him at the Annual Meeting in Chattanooga, Tenn.

The local committee, consisting of R. M. Mitchell, Chairman, R. W. Glenn, and J. D. Sandridge, arranged a very interesting program of entertainment.

The Reservation Card Prize Drawing was won by W. R. Ivey, E. I. duPont de Nemours Company, Dyestuff Division, Greenville, S. C.

Attendance 150.

Respectfully submitted,

ARTHUR R. THOMPSON, JR., *Secretary.*

Purchasing for Textile Mills and Some Commercial Aspects of Same

By HILL HUNTER

Purchasing Agent, Proximity Manufacturing Company

AS a youth I was always taught that children should be seen and not heard, and being one of the youngest members of this organization, I feel that I should be listening and some one else doing the talking. However, Lonnie Barnes and Jack Crist, Bob Glenn and Paul Haddock insisted on my doing the talking, evidently with the idea in mind that the young of the present generation were being heard as well as seen, and I want to go on record now that any sins of omission or commission will be upon their heads.

The first thing I want to say is that I appreciate very much having been admitted to this organization, and I sincerely trust that my association with you will work out to our mutual benefit.

At the time of being approached on the subject of making a talk here tonight, I asked several of the boys along just what lines I had better make my remarks, and some of them suggested it would not be maiss to say something about the economic situation, present and future.

As you are painfully aware of the present, I will confine my remarks to the future, and with this thought in mind I made it a point to investigate several of the prophets, both major and minor, in an endeavor if possible, to find out something that would be of interest, consequently I examined closely the prognostications of all the paid prophets, seers, soothsayers, etc., that I could find, and the result of this has been that one widely-known business authority says that the depression will probably continue through 1931, while another thought that improvement would appear with the robins in the spring, and still

another prophesied that we were in for a long dry spell of several years' duration, so I have about come to the conclusion that one man's guess is as good as another. So out of all this babel of tongues and confusion there is one thing I believe clearly stands out, and that is that this present deflation era has been and is thorough and drastic, with the result that a secure foundation is being laid for later improvement, and as to the time when this improvement will show itself, no man knows.

There appears to be one general agreement, and that is that the textile industry will be among the first to feel any improvement that may take place, and I think this feeling is well founded, and based on the following reasons:

First, the industry has been in a depression for five or six years, and this brings to my mind an incident that happened at my home the other day, when my 15 year old boy in all seriousness asked me if there ever had been a time when the textile industry was good, and this question was well founded for, within his recollection, that is his recollection of anything economic, the industry has been in bad shape.

Another reason is that the raw materials entering into textiles, that is cotton, wool, silk, rayon, etc., have declined and have been more drastically deflated than other commodities, and still another reason the finished product, cotton goods, silk goods, hosiery, rayons, etc., show the most drastic declines, that is in proportion to the prices of the raw materials.

In other words, in this distressing deflating era, the textile industry has been the bell-wether, and economic history shows that industries which go through the longest and most severe deflations are usually the ones to recover first.

Among several flies in the economic ointment, there are two big ones that it is hard for me to see how things can permanently improve until these two are pulled out. I have reference, first, to the conditions in Europe and, second, to the wide spread that exists between wholesale and retail prices. At the present time, wholesale commodities are approximately 15 per cent above the low point of pre-war levels, while retail prices have declined only about 6 per cent, and in view of the fact that dear old Ultimate Consumer is in the final analysis the spring from which all economic prosperity flows, until and when his buying power is rehabilitated, and this condition is corrected, it is hard for me to see how things can be adjusted. I fully realize and appreciate the fact that the above statement is trite, but nevertheless I believe it to be true.

Soon after I left State College—I was there four years with Tommy Nelson—as a matter of fact, Tommy and I landed in West Raleigh about the same time, so you can see that has been a long time ago—I met on the street an old friend of mine from Oxford. He asked me what I was doing and I told him I was a Purchasing Agent. He said, "What is that?" and I told him that a Purchasing Agent was a man who spent lots of other people's money but very little of his own.

The Editor of the Textile Colorist said that in his opinion a Purchasing Agent was simply a carbuncle on the neck of business, while Elbert Hubbard said "The typical Purchasing Agent is a man past middle life, spare, wrinkled, intelligent, cold, passive, noncommittal, with eyes like a codfish, polite in contact, but at the same time unresponsive, cool, calm, and damnably composed as a concrete post or a plaster paris cat, a human petrifaction with a heart of feldspar and without charm or a friendly germ, minus bowels, passions or sense of humor. Happily they never reproduce, and all of them finally go to hell."

The only objection that I have to the above characterization is that part that states they never reproduce, as I feel that it is carrying matters a little too far to make a buck nun out of us.

You might well ask the question, just why do we have in the industry purchasing agents? I would answer that question by saying that in my opinion it is justified on the grounds of bringing about a condition of co-ordination and standardization, this in turn bringing about an increase in volume, and the corollary to this is increased purchasing power. This is particularly true at the present time when we are in a buyer's market.

The requirements of a textile plant can be divided into three classifications.

First, there are the materials that enter into the manufactured product, such as dyestuffs, chemicals, sizing, finishing materials, etc. (Cotton is not taken into consideration here as this is bought and handled by the cotton department, which in the larger organizations is entirely separate and distinct from the general purchasing department.)

Second, there are materials essential to plant operation, such as coal, oil, shipping supplies, and a long list of items that could be classified under mill, electrical, machine shop, power plant and textile supplies, entirely too numerous to mention in detail.

Third, requirements that enter into and are part of the capital account, such as equipment for enlargement of plant capacity and buildings.

Very naturally, the members of this organization are more interested in materials going into manufactured product, such as dyes, chemicals, finishing and sizing materials, etc., and in the handling of these materials, that is if they are to be bought successfully I feel that there are three things essential.

First is cooperation; second, a first class chemist and laboratory; and third, volume.

By cooperation I mean that the buyer, dyer and operating end of the business should work together as one.

Each should know and fully appreciate the problems peculiar to the other. There has been some criticism of purchasing agents in connection with dyestuff buying, and in all probability some of it is fully justified, but I sincerely feel and believe that where the proper cooperation exists, that it is to the interest of the larger units in the industry to centralize their buying of dyes, the reasons for this being that it relieves the operating end of the business from the necessity of having to interview a large number of callers, and in the very nature of things, a busy dyer does not have the time and is not in a position to go thoroughly into and examine the various market ramifications that exist in the dyestuff industry.

As most of you well know, there are lots of twists and turns in the dyestuff game, and I do not suppose any one man ever learns it all, and it is exceedingly hard for me to see how the average man can carry on as a dyer and successfully do the buying of dyestuffs. Of course I fully appreciate that he could spend the money, but what I mean is to get a maximum value.

A first class chemist and laboratory is the buyer's right hand in successful dye buying. Control samples of all dyes should be kept in the laboratory and all dyes should be passed on by the laboratory before going into use, as this will in a large measure keep off-shade colors out of the manufactured product and prevent subsequent dissatisfaction and loss of merchandise. As in other commodities, volume plays an important part in successful dyestuff buying, for the very simple reason that it cuts down selling costs.

Suppose for instance we are using certain types of a color, sulphur brown for instance, at three or four of our plants. If we can bring these colors together and standardize on two or three types, so as to make them a common denominator and bring the tonnage up, you just naturally look better to the dyestuff ambassadors and some day you may meet and get to know a vice-president or possibly a Southern manager, entitlements which in lots of instances I might add are only as of sounding brass and tinkling cymbals.

Speaking about tonnage buyers, I was on one occasion with several buyers and dyestuff men in New York, and while we were up in a room drinking ice water, one of the fellows asked Bob Glenn, who was present, why he always passed me the water first, and Bob very promptly replied that he did so for the simple reason that I was of considerably heavier tonnage, so you can see that the theory works out in more ways than one.

Chemicals as a rule are easier to buy than dyestuffs as usually the buying is done on definite specifications and it is seldom necessary to make claims on account of offgrades. The big chemical manufacturers take considerable pride in the uniformity and quality of their product and maintain strict control in their manufacturing process, and use every precaution to see that deliveries conform exactly to the standards and specifications sold by them.

I feel that every plant should maintain a competent research department. I suppose you have heard this so often that it grows tiresome, but at the same time it remains a very definite fact that it costs any mill lots of money not to have a department of this character.

I was talking the other day with one of the largest starch manufacturers in this country, and he told me that the best paying department in his business was his research department and that it was worth more to him in dollars and cents than any other department in his business.

When you think of the large number of items that go to make up the manufactured product, it is easy to see the necessity for constant investigation into the items best fitted to the given conditions, that is, those that can be most economically used, and in this day of thin profit margins, if any at all, the necessity of finding satisfactory and less costly things to substitute is obvious, and the only way I know to do this successfully in a large way is to maintain a department that is constantly on the lookout and making constant experiments in order to ascertain what can be used under any given condition to a maximum advantage.

A large number of mills make their own sizing and finishing compounds and where they do not I have always felt that buying should be done on specifications. The better class of manufacturers welcome specification buying in this class of material as it takes all of the hocus-pocus out of it and puts them on an equal basis in the bidding. Where mills make their own sizing and finishing material, component parts that are common to all can be bulked and bought in quantity.

Fundamentally, the buying department of the business is also a selling department, money being the commodity disposed of. Any one can exchange a dollar for a piece of merchandise, but making the money go the maximum distance is not so easily done. Just as some salesmen of merchandise are able to present their wares in more attractive form, some companies are able to make their money look bigger and better, that is, they will standardize as far as possible to bring their volume up to an impressive point, pay bills promptly, making the credit phase attractive, build up a reputation for fair dealing and make friends in the trade.

When it comes to the technique of buying, there are no set rules to follow, that I know of, as every individual takes a course that seems to him best. However, there is one rule that has been given in fable form that can be followed with safety. This will probably sound somewhat old and hackneyed to you, but it is so particularly applicable in the buying of dyestuffs, chemicals, sizing and finishing materials, that I feel I would be remiss if I did not again quote it here. It reads as follows:

Proceedings of the American Association of Textile Chemists and Colorists

In the City of Bagdad lived Hakeem, the Wise One, and many people went to him for counsel, which he gave freely to all, asking nothing in return. There came to him a young man who had spent much and received little, and said, "Tell me, Wise One, what shall I do to receive the most for that which I spend?" Hakeem answered, "The thing that is bought or sold has no value unless it contains that which cannot be bought or sold. Look for the priceless ingredient."

"But what is the priceless ingredient?" asked the young man.

Spoke the Wise One, "My son, the priceless ingredient of every product in the market place is the honor and integrity of him who makes it. Consider well his name before you buy!"

Bleaching with Liquid Chlorine or Hydrogen Peroxide 100 Volume for Hosiery

By G. H. Dubois

WE have had in the past some excellent papers on hosiery dyeing, yarn dyeing and bleaching, so for a change I will take for my subject, Bleaching with Liquid Chlorine or Hydrogen Peroxide 100 Volume for Hosiery.

Both are excellent bleaching agents, I will first discuss Liquid Chlorine Bleach, not for the purpose of telling any of you how to bleach, but to give you some practical experience which I have found and pass the same to you.

The first to consider is the boiling keir if one is to be used, and you no doubt have read in the Textile Papers at different times of kier stains on the goods. One method I have used successfully to avoid these stains is painting the kier on the inside with a mixture of cement and water to the consistency that it will not run in water marks; let this dry and follow up with 50 to 100 pounds of Caustic Soda, fill with hot water and raise to the boil for 20 to 30 minutes, run off and let cool. This will help to bake the coating. Repeat at different times when necessary.

We now come to the boiling out; first we must know what material we are to bleach and if the goods need a keir alkali boil. A combination of Caustic Soda, Soda Ash and a Solvent make up a very good cleanser. Boiling under pressure three to four hours as a prolonged boil has a tendency to harshen the goods. This is followed up by a hot running wash and cold wash.

The goods are now ready for bleaching. We now prepare our Liquid Chlorine stock solution to feed our standing bath if one is used. The following makes up the stock solution:

For 90 gallons of water.
77 lbs. 58% Solvay Soda Ash
22 lbs. Liquid Chlorine.

Part Caustic Soda can be used if conditions require it.

We are ready to bleach the goods and make up the standing bath. I have found that the Twaddle or Beaume hydrometer are not sensitive enough for an accurate control of the bleach bath, so I made the following solutions in making my tests:

(1) Iodized solution to use on white filter paper.
Dissolve 5 grams potato starch in 100cc water
5 " Potassium Iodide CP in 100cc water
then add 300cc water this makes a 500cc solution.
Wet the filters papers in this solution then air dry, cut in small strips and they are ready for use.

(2) Dissolve 24,800 grams Sodium Hyposulphite CP in 500cc water.

(3) Testing the standing or bleaching bath, take 100cc of the bath in a beaker.
In a burette of 100cc capacity fill with Hyposulphite of Soda reagent, and titrate until iodized paper shows no blue reaction which takes 13cc from the burette. This I have found to make a standard bleaching bath giving a good white. Bleach for one hour at 80° F. By this method you can control your bleach from 1cc to 13cc.
If your blue reaction clears before 13cc, add more of your stock bath, and if it does not clear at 13cc add water to your bleaching bath.
After bleaching I rinse, next sour and for an anti-chlor I use ½ to 1% Hyposulphite of Soda for 5 minutes. This test is made by taking a strip of the iodized paper, lay on the material and twist, this will tell you if you have any chlorine left. In the same bath I add 3% Muriatic Acid and run 15 minutes longer, rinse, hot soap bath and blue. Test here with blue litmus paper so that you are slightly on the acid side.
I will now pass on to Hydrogen Peroxide bleach.
With this bleaching agent we can bleach by the one or two bath method. I prefer the latter as it's a saving on Peroxide.
The samples I have before you are all one hour bleach and for your inspection.

(1) Mercerized rayon and mercerized hosiery—scour at 150° F. with some good solvent and mild alkali, hot and warm rinse.
Bleach in monel metal machine with open steam pipe at 190° F. to 200° F. for one hour, approximately 425 gallons of water, 160 pounds of goods, 6 to 12 pounds Silicate of Soda, one and one-half gallons Hydrogen Peroxide are used.

(2) Cotton hosiery—a 20 to 30 minutes' boil, hot and warm rinse, 2 to 3 gallons Hydrogen Peroxide, 12 pounds Silicate of Soda, bleach for one to two hours.

(3) Silk and mercerized hosiery—scour first, start bleach at 160° F., add 8% boil-off oil, 5% Silicate of Soda,

2 gallons Hydrogen Peroxide. Raise to 200° F., hold one hour. Some styles may take up to 15% boil-off oil.

(4) All above bleach baths are started at 140° F.

(5) Wool hosiery—start at 130° F., add 9 pounds Silicate of Soda, 2 to 3 gallons Hydrogen Peroxide, hold three to four hours.

(6) All bleached goods are hot washed and soaped, followed by rinse and warm blueing bath if necessary.

RHODE ISLAND SECTION MEETING

Date: Thursday evening, March 5th, 1931.

Place: Rooms of Providence Engineering Society, 44 Washington Street, Providence, R. I.

Time: 8:15 P. M.

Speaker: Dr. E. W. Peirce of Ciba Company, Inc.

Subject: "Latest Developments in the Application of Fast Colors."

We will also be favored with a short talk on "Abnormal Fading of Mixed Shades" by William H. Cady of Slater Company.

A. Newton Graves, *Secretary*.

SOUTH CENTRAL SECTION MEETING

THE South Central Section of the American Association of Textile Chemists and Colorists met at the Read House in Chattanooga on Saturday evening, February 7, for the first regular meeting of the year.

After a buffet supper and an enjoyable entertainment, the meeting was called to order by the Chairman.

E. Y. Chapin, President of the American Trust & Banking Company, gave an interesting and instructive talk on present business conditions. Following this, a very helpful paper was read by G. H. Dubois on "Bleaching with Liquid Chlorine or Hydrogen Peroxide 100 Volume."

The minutes of the last meeting were then read and adopted, and the Treasurer submitted his annual report, which was adopted. A vote of thanks was extended the Treasurer for his work in behalf of the Section.

A vote of appreciation was extended the Chairman for the manner in which he conducted affairs at the Annual Meeting of the Association, and he was requested to serve as chairman for another year.

Following this, the Nominating Committee submitted the following nominations. They were unanimously elected:

R. S. Wheeler, Chairman
Noel D. White, Vice-Chairman
H. A. Rodgers, Treasurer
J. D. Mosheim, Secretary

A rising vote of thanks was extended W. J. Kelly, Jr., for his excellent work on the Entertainment Committee. The Chair requested that he serve another year as chairman of the Entertainment Committee.

It was suggested by the Chair that the members submit suggestions as to subjects they would like to have discussed at the meetings.

There being no further business, the meeting was adjourned.

Respectfully submitted,

J. D. Mosheim, *Secretary*.

AMERICAN DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
Professor of Chemistry and Dyeing, Lowell Textile Institute
Directing Editor

BLISS MORRIS JONES
Managing Editor

MYRON DREW REESER
Advertising Manager

Published biweekly by
HOWES PUBLISHING CO., INC.
440 Fourth Avenue, New York City

A. P. HOWES, President — M. D. REESER, Secretary — H. F. CRAWFORD, Treasurer

Subscription price $5.00 per year; Canadian $5.50; foreign $6.00

Vol. XX March 2, 1931 No. 4

TEN COMMANDMENTS FOR FOREMEN

A large factory in San Francisco is responsible for what is known as the "Ten Commandments for Foremen." According to the story, these commandments are posted conspicuously in the factory superintendent's office. They are of such indisputable value that we are reprinting them here in the hope that they may be of use in our industry. Needless to say, if every foreman obeyed these commands strictly at all times, the excessive cost of labor turnover would be largely eliminated. The "commandments" follow:

1. Be fair. Have no favorites and no scapegoats. A foreman has to act as judge many times every day; therefore, he must be just.

2. Make few promises and keep them. A foreman must be exact in this particular. Sometimes a foreman forgets that his job requires a high standard of truth and honor.

3. Don't waste anger—use it. Anger is valuable and should not be used carelessly. Keep your most forceful language for special occasions.

4. Always hear the other side. Never blame a worker until he has been given a chance to give his point of view.

5. Don't hold spite. When you have had to scold a worker, go to him later and show him his faults in a friendly way.

6. Never show disappointment. Never let yourself be beaten. A foreman must have perseverance and the "never-say-die" spirit.

7. Notice good work as well as bad. Let the workers see you can appreciate as well as condemn.

8. Watch for special ability. Take a keen human interest in your workers. Put each one where he can do his best.

9. Take your full share of the blame. This is the most difficult of all. The foreman who can share both blame and praise with his workers has discovered the secret of managing them.

10. Prevent accidents. Educate or eliminate the careless man. The good foreman is known by his men.

STABILITY OF EMPLOYMENT

AS A first step in marshalling the forces of business with the ultimate aim of devising measures to insure stability of employment and shield it against the disturbing effects of seasonal and cyclical fluctuation the Chamber of Commerce of the United States announced that a committee of business executives and economists will be appointed to sound the possibilities of a constructive approach to the problem.

In making the announcement Julius H. Barnes, chairman of the Board of the National Chamber, emphasized the assertion that the task is one to be done by business itself and not by government, if the principles under which the United States has grown to be the greatest of industrial nations are to be preserved.

He suggested the feasibility of supplementing individual effort at stabilization with the wider co-operative trade association efforts to minimize as far as possible the ill effects of industrial change. By strengthening the key industries in this respect, he pointed out, and relieving a substantial number of wage-earners of the fear of insecurity, a framework will be provided which will give greater rigidity to the entire industrial structure.

"American business," said Mr. Barnes, "is well aware of its responsibility in maintaining the fullest possible measure of employment. It is as desirable from an economic as a social viewpoint, for unemployment is symptomatic of a general ailment which affects alike the wage-earner and the investor. So close are economic relationships today and so complicated the mechanism of production and distribution that no one branch of industry, nor economic class can long escape the untoward effects of a depression with which others might be afflicted. The maintenance of the earning capacity of the worker is as necessary to business as the maintenance of the consuming capacity of the farmer.

"The problem is to find a practical method of minimizing, at least, the disturbing effects of industrial change which is the inevitable accompaniment of progress. Industry finds it necessary to adjust itself to new conditions, new methods, new processes which science and invention are constantly bringing forward. Employment is constantly shifting from old channels to new, and labor left to its own devices of relying upon individual resources, oftentimes does not keep pace with these changes as they occur.

"In a condition of this kind the thing to be feared most is fear itself. Confidence, tempered with prudence, is necessary to the operation of even the most perfect busi-

ness mechanism. The retarding effect of a sense of insecurity is promptly communicated from worker to consumer, from consumer to producer and the whole machine stalls, and the anticipated evil becomes real.

"At the same time the question is one of growing importance from the viewpoint of industrial management. Manufacturing plants are highly mechanized institutions. Skilled workers cannot be casually replaced at the factory gates. Displacement of employees, even temporarily, involves enormous economic waste.

"Business executives are quite aware that no industry stands by itself. If the automobile industry lags, a dozen others lanquish. If the electrical industry falls behind, copper hesitates. At the same time all the members of a given industry are adversely affected by these larger causes, and caught in the same grip of circumstance.

"This interdependence has given rise to the trade association movement which has developed further in the United States than in any other country. Perhaps the time has now arrived for putting this type of organization to the test. If the individual manufacturer can overcome the difficulties which stand in the way of security and continuity of employment in his own business, can the industry as a whole obviate the difficulties which stand in the way of the same achievement in the larger field? Can they, by co-operating with other industries, avoid the dislocations so devastating in their effects and the occasion of such widespread distress?

"If a certain number of key industries could give their workers the assurance of uninterrupted employment and sustained earning capacity, they would set up against the recurrent waves of apprehension and distress that characterize every business depression a formidable barrier and buttress the general sense of security which is so important a factor in the maintenance of business activity.

"Here, at least, is a starting point. In the belief that something can be accomplished in this direction the National Chamber is asking the service of men of proven leadership in various lines of industry to consider the practicability of steps by which workers in certain key industries may be given assurance of some degree of continuity of employment. Different industries, it is true, face different conditions, just as each individual manufacturer faces a peculiar set of circumstances. But there is certainly a sufficient community of interest, a mutuality of advantage and similarity of method in all industries, which are inextricably tied together in the same general enterprise, to serve as a basis for a greater degree of co-operation among them in the attempt to devise practical methods of meeting this great problem."

The New York sales offices of E. I. du Pont de Nemours & Co. have moved from 8 Thomas St. to 61 Thomas St. At the new address they will extend full services of consultation on dyeing problems and maintain complete laboratory facilities.

Unusual Uses of Soap in Industry

We all think of soap as a product used for cleaning. Few people realize that immense quantities of soap are used every year in industry for purposes far removed from the primary use in cleaning. Soap is, for example, an ingredient in twine, in some kinds of paper, in linoleum, in metal polishes of all kinds, according to a recent survey of the Procter & Gamble Company describing the industrial uses of soap.

In making playing cards, neutral soaps are used to put the gloss on card stock, and soap has an important use in the manufacture of both fine and cheap grades of paper. Likewise, soap is used in cordage mills to improve the gloss and finish of cord and twine. Linoleum manufacturers and manufacturers of artificial leather use it for softening jute and also as an ingredient in the finish of their goods.

Rubber manufacturers use soap for coating molds with a soap solution to keep the casings from adhering to the rubber. Manufacturers of silver polish are almost unanimous in their selection of Ivory soap as a base for their preparations. Soap is also a base for shoe polishes and stove polishes.

Florists in greenhouses use powdered Ivory with or without paris green, for spraying flowers.

Soap solutions are also used to cleanse and "pickle" pieces of machinery. It is especially used by manufacturers of fine machinery such as typewriters, adding machines, optical instruments, etc.

Oil and lubricant manufacturers frequently use soap as a base for emulsions, lubricants and dressings.

Besides these unfamiliar uses of soap, this product has many unusual cleansing uses. Jewelry and watch manufacturers use Ivory soap for burnishing and cleansing before plating. Plating works use soap in a somewhat similar manner. Manufacturing pharmacists often use pure soaps like Ivory as a basis for tooth pastes, creams and shampoos. Textile mills use soap chips, bar soaps and solid soaps in processing and finishing. Carpet cleaners, dry cleaners and dyers, hotels, laundries and various public and semi-public institutions use enormous amounts of soap yearly.

Dinner of the Drug, Chemical and Allied Trades

The Sixth Annual New York Drug Trade Dinner will be held at the Hotel Commodore on Thursday evening, March 12th, under the auspices of the Drug, Chemical and Allied Trades Section of the New York Board of Trade.

The dinner is open-night for the foregathering of the manufacturing, wholesale and allied branches of the trade. The attendance embraces principals and the executive keymen of the industry and represents an inventory of "Who's Who" in the trade.

Silk in the Molecular Still[1]

By **R. T. MEASE[2] and WM. D. APPEL[3]**

THE successful distillation of a material depends upon its vapor pressure. Substances having a relatively high vapor pressure at ordinary temperatures or whose vapor pressure can be increased sufficiently by heating below the temperature at which decomposition takes place are readily distilled in the usual equipment. Some substances such as certain waxes and resins cannot be heated much above their melting point without decomposition, and others like the proteins, hair, horn and also silk fibroin are decomposed by heating to temperatures below their softening point. If such materials are to be distilled it must be done at comparatively low temperature and greatly reduced pressure.

The successful distillation of cane sugar, and other organic compounds of high molecular weight by Washburn and his co-workers[4] suggested the possibility of distilling silk fibroin or of separating it into components differing in vapor pressure. If this could be accomplished new light would be thrown on the constitution of this important textile material. Although the attempt to distill fibroin was not successful it appears worth while to record the experiment.

The Molecular Still

The essential features of a molecular still, as enumerated by Washburn[5], are:

1. A high vacuum.
2. A large and clean area of evaporating surface.
3. A short distance between the evaporating surface and the condenser.
4. A sufficient temperature difference between the distilling surface and the condensing surface.

It is obvious that the nature of the material to be distilled is a large factor in determining the type of still to be used as well as the method and order of assembling the parts. The still used in the experiment to be described is shown diagrammatically in Figure 1, which is self-explanatory.

In order to avoid heating of the fibroin when tube A on which it was wound was being sealed to tube D, A was filled with water to above the position of the silk and D was immersed in a water bath. In order to hold the fibroin at a constant temperature, liquids of known boiling points were used in tube A and kept boiling by means of the electric heating coil N. Xylene, which has a boiling point of 142° C., was used in the final experiment. Tube A was silvered on the inside to minimize loss of heat by radiation to tube D. Tube D was kept cold by immersing it in a bath of liquid air. The distance between the outside wall of tube A and the inside wall of tube D was about 2 millimeters and the difference in temperature during the final experiment was about 300° C.

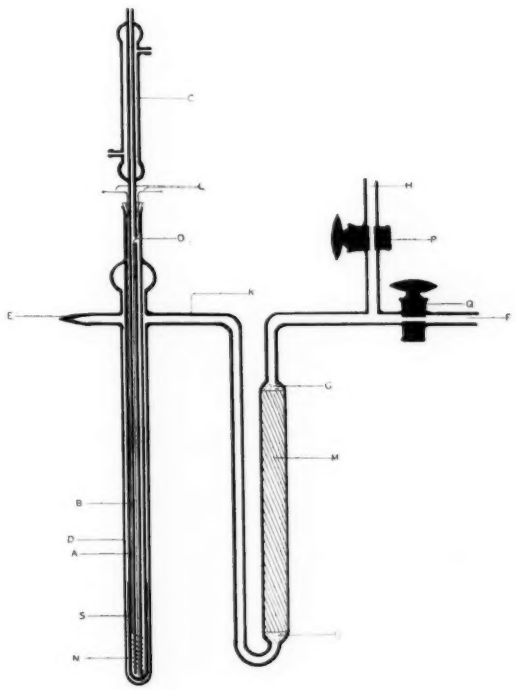

Fig. 1

Diagrammatic View of the Still.
C—Water-cooled condenser; L—Electric leads; O—Orifice for escape of xylene vapors; E—Hydrogen inlet tube; K—Still outlet; B—Support tube for heater coil; D—Tube serving as condensing surface; A—Tube serving as retort;—S—Silk fibroin; N—Nichrome resistance coil for heating; G—Glass wool; M—Activated charcoal; P-Q—Large bore stop-cocks; H—to high vacuum reservoir; F—To fore-vacuum reservoir.

---

[1] Publication approved by the Director of the National Bureau of Standards, U. S. Department of Commerce.

[2] Assistant Chemist, Bureau of Standards.

[3] Chief, Textile Section, Bureau of Standards.

[4] E. W. Washburn, J. H. Brunn and M. M. Hicks, "Apparatus and Methods for the Separation, Identification and Determination of the Chemical Constituents of Petroleum," Bureau of Standards, Journal of Research, Vol. 2, pages 467-488.

[5] See reference 4. This also gives the theory of the still and references to the literature concerning it.

The still was connected through a liquid air trap to a McCleod gage which was used to measure the pressure. During the experiment the pressure in the system probably was of the order of the vapor pressure of mercury at the temperature of liquid air.

Figure 2 shows the apparatus with the necessary auxiliary equipment ready for the experiment.

The Fibroin

A sample of silk fibroin, specially collected in China for research purposes, was obtained through the courtesy of Elbert M. Shelton and Cheney Brothers, South Manchester, Connecticut. The sericin was removed from the silk by boiling it in neutral soap solution and successively extracting with water, ethyl alcohol and ether. After winding the fibroin on tube A it was again thoroughly extracted and air-dried at room temperature. Tube A was sealed in the apparatus with the precautions given above.

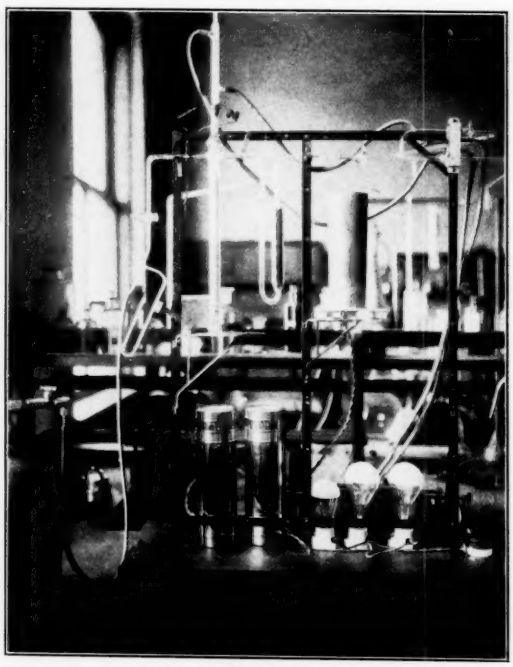

Fig. 2

Still and Auxiliary Equipment.

The Experiment

Preliminary runs indicated that no distillation could be obtained in a reasonable time at temperatures below the boiling point of xylene, 142° C. The final run was made at this temperature in the following way. The system was connected through F to the fore vacuum pump. The xylene in tube A was brought to boiling and the carbon chamber M was heated to about 350° C. by means of an electric furnace shown above and to the right of the center of Figure 2. After heating in this manner for 5 hours a gentle stream of hydrogen was drawn through the apparatus and the inlet tube E was then permanently sealed. Hydrogen was then removed from the system by means of the high vacuum pump through outlet H until the pressure was less than that which could be detected on the McCleod gage. As a precaution the evacuation and heating were continued for three hours more. The silk and carbon were then considered to be sufficiently free from adsorbed gases to attempt the distillation of the silk fibroin. This high vacuum was then maintained throughout the experiment. It was possible to do so independently of the pumps when it became necessary to shut them off for any reason, by simply closing the stopcocks and placing a liquid air bath around the carbon chamber. Tube A holding the silk was kept at 142° C. the silk being treated by conduction through the walls of the tube. Tube D was kept cold in a bath of liquid air. The duration of the experiment under the optimum conditions for the migration of molecules from the surface of the silk to the condensing surface was 90 hours. At the end of this time no condensate could be seen on the inner walls of tube D.

Conclusion

This experiment indicates that the vapor pressure of silk fibroin (or its constituents) is very low even when it is heated to a temperature considerably above 100° C.

Chemists Discuss Rayon Industry

The 128th annual meeting of the New England Association of Chemistry Teachers was held with sessions at the Lowell Textile Insitute and Lowell High School, Lowell, Mass. More than 50 chemists inspected the Lowell Textile Institute and during the entire session there was much discussion of the rayon industry. At the Institute the delegates saw a rayon machine in operation. It is similar to the 800 now being used night and day by the Amoskeag Company of Manchester, N. H., which is turning out 1,000,000 pounds of rayon yearly. President Edward Damon of Keene, N. H., presided at the afternoon session.

Professor Louis A. Olney of the Lowell Textile Institute was one of the chief speakers, taking for his topic "Chemistry as It Relates to the Textile Industry." He spoke on the subject of dyes and of the application of dyes by various concerns. He also touched on the rayon industry and exhibited samples.

Agent Royal P. White, of the Sterling Woolen Mills and chairman of the Textile Institute trustees, spoke on "The Aims of the Textile School." He touched on the woolen industry and said that its decline was attributed by some to overproduction and by others to underconsumption.

"Rayon" was the subject discussed by Professor Frederick R. Butler of Worcester Polytechnic Institute. He told of a recent visit and tour of inspection of du Pont plants, where rayon and cellophane are made and of the many uses both were being put to. Other speakers were Professor Jennings of W. P. I. chemistry department, who spoke on the dyeing end of chemistry, and Professor Wilhelm Sagerblom, head of the chemistry department at Exeter Academy.

Determination of pH of Cotton Cloth

(Continued from page 138)

grams, 1.87 grams and 1.95 grams were boiled (separately) in 100cc of distilled water until the volume of H_2O was reduced to 75cc. The cloth was then squeezed with a glass rod and removed. The extracts were cooled to 22°C, 20 drops of quinhydrone solution added and the results of table No. 4 obtained.

TABLE 4

Weight	pH
1.67 g.	6.08
1.87 g.	6.04
1.95 g.	6.02

Figures in the second decimal place are given to show the trend of results and not for demonstration of accuracy as it is not believed that results can be accurate to less than 0.1 of a pH unit. The conclusion, therefore, is that for differences of 15% or less in weight of sample pH values are constant (other things being equal).

One source of error was thought to be absorption of sulphur from the illuminating gas used for heating. Extractions were first made in open flasks over the burner; so to improve this condition, Erlenmeyer flasks were used and these were fitted with the air condenser sketched in Figure 2. The lower extremity was blown into a bulbous form with small opening and fitted into the mouth of the flask. Tests were then made with and without the air condenser on samples weighing exactly the same (1.95 g.); and all the conditions of the tests similar to those given in the standard procedure excepting that 100cc of H_2O was poured over the cloth for extraction, and 75cc of the extract used in the tests. The results showed that extraction without the condenser lowered the pH considerably, and are as follows:

A. test without condenser pH 5.20 (5.2)
B. test with condenser pH 5.68 (5.7)

Another test conducted with an earlier form of calomel electrode and employing 100cc of extract gave a pH of 7.2 which brought up the question of volume of extract and differences due to the electrodes themselves.

It was proved that there are differences due to the electrodes themselves, but lack of time prevented investigation into the question of differences due to varying volumes of extract.

It was observed that variations resulted if the time for reading the potential (after the electrodes were dipped in the test solution) varied. This could be due either to lack of sufficient time for the solution and electrodes to come to equilibrium, or to leakage of KCl from the salt bridge into the solution. To solve this question, tests on distilled water were made with varying amounts of time for the electrodes to remain in the solution before reading the potential. Results are given in Table No. 5 which shows that the pH (using this method) keeps dropping steadily even up to an hour. The question of leakage of KCl solution past the ground glass stopper having any effect on the pH was settled at the same time by adding drops of KCl to the solution of test No. 6. One drop reduced the pH from 6.7 to 6.5 and two drops to 6.4—but these changes took place in about the length of time allowed in test No. 5 and test No. 4 and were probably due to the increase in time element rather than to effect of the KCl added.

TABLE 5

Number of Test	(Electrodes Time in Solution)	Resulting pH
1	1 hour	5.4
2	15 minutes	5.8
3	10 minutes	6.3
4	5 minutes	6.4
5	3 minutes	6.5
6	less than 1 minute (quick test)	6.7

At this point a series of tests on acid-treated cloth were made to determine the limits of application of the apparatus and methods. The boiled-out, bleached cotton cloth samples of about 2 grams each were steeped in a solution of $\frac{N}{20}$ H_2SO_4 for over 2 hours.

Test No. 1. A 2.06 g. sample was suspended over the steeping bath for 15 minutes in order for excess liquid to drip back into the bath. This constituted the sample with as much acid as could be obtained by steeping. It was extracted in 80cc of water under the condenser, and 75cc of extract was cooled to 20°C, 25 drops of quinhydrone solution added and the pH found to be 4.65.

Test No. 2. Another 2.06 g. sample was removed from the steeping bath, alternately squeezed and rinsed three times, and extracted as in test No. 1. The pH was found to be 5.96.

Test No. 3. A check of test No. 1 was run on a 1.94 g. sample which gave a pH of 4.60.

Test No. 4. Another 1.94 g. sample was treated as in test No. 2, and immersed for 5 minutes in dilute NaOH solution besides alternate squeezings and rinsings. After removal from the caustic solution it was subject to two more squeezings and rinsings; and resulted, after extraction and cooling, in a pH of 5.50.

The result of test No. 4 was lower in pH than that of test No. 2 and showed that error was still being introduced.

One very important point was found to aid greatly in stabilizing the pH during a test. In the previous pH

determinations, the gold-wire electrode was left exposed to the air when not being used, but this was found to be one of the chief reasons for rapid drop in pH during a test. It was found that vastly improved results were obtained if the gold-wire electrode was treated as follows:

Previous to making the determinations, the gold-wire electrode is kept immersed in dilute nitric acid, and just before using, it is rinsed, neutralized with dilute ammonia, and again thoroughly rinsed. It can then be inserted into stopper "b" along with KCl tube "d" (see Fig. 4).

The nitric acid serves to keep the gold wire always clean.

It is necessary to boil-off new rubber stoppers in caustic solution to remove all sources of sulphur. They are then neutralized in dilute nitric acid and thoroughly rinsed.

After these points were definitely cleared up the standard procedure outlined in part A was formulated. Before going through the steps of this process, the potentiometer must be balanced up against its standard cell so that the galvanometer needle remains motionless when the circuit button is depressed. The calomel electrode also must be previously prepared by drawing fresh, saturated KCl solution up into the reservior bulb. Fresh KCl solution is also used in KCl tube "d." In determining pH values below pH 7.0, the negative electrode of the potentiometer is connected to the calomel electrode, the positive potentiometer electrode to the gold-wire electrode. For pH values above pH 7.0, the connections are reversed. Conversion of the potential readings is accomplished with a special slide rule or from tables.

The results of the experiments on the series of acid-treated and alkali-treated cotton cloth, both heated and unheated, were obtained by the method outlined in the standard procedure, and are given in tables No. 6 and No. 7. These results are averages of two or more tests in every case; and it was found that check results were fairly constant.

TABLE 6

pH VALUES OF EXTRACT OF H_2SO_4 TREATED COTTON SAMPLES

Steeping Bath Normality	pH of 1st Boil-off	pH of 2d Boil-off	pH of 3rd Boil-off	pH of 4th Boil-off	pH After Heat-treated
Untreated	5.6	5.5			5.8
0.0001 N	5.4	5.5			5.7
0.001 N	5.1	5.4			5.1
0.01 N	4.3	5.1	5.4		4.7

TABLE 7

pH VALUES OF EXTRACTS OF NaOH TREATED COTTON SAMPLES

Steeping Bath Normality	pH of 1st Boil-off	pH of 2d Boil-off	pH of 3rd Boil-off	pH of 4th Boil-off	pH After Heat-treated
Untreated	5.7	5.9	5.9		5.7
0.0001 N	5.7	6.0	5.9		5.6
0.001 N	5.9	6.0	5.9		5.6
0.01 N	8.3	7.5	6.7	6.2	6.3

Determination of, and Effect of H_2SO_4 and NaOH on the Strength of Cotton Cloth Before and After Heating

For these tests standard strips were used. The cloth was cut six inches along the warp and one and one half inches along the filling. The strips were then raveled down to sixty-six ends per inch which was approximately one inch. Ten strips were used for each test, and the breaks were made in the warp threads.

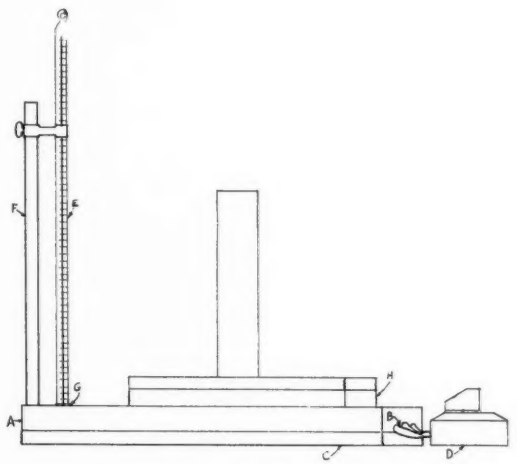

Fig. 10

The hot iron, Fig. 10, used for these tests consists of a hollow polished bar of steel (A). Inside there is a triple heating coil (B) embedded into a silica composition so that it cannot oxidize. The base (C) consists of a heavy asbestos board. The temperature is controlled by the switch (D). The switch has a high, medium, and low heat control. By switching from low to medium an additional heating coil is used, and the same is true in changing from medium to high. The temperature is observed by means of the thermometer (E) which is held by the brace (F). The thermometer bulb fits into a hole in the iron (G) which is filled with mercury. This mercury well (G) is drilled in such a way that it does not interfere with the heating coils and it also maintains the same temperature as the center of the iron. For covering the strip during the heat treatment a sheet of steel (H) ¼" x 6" x 4" is used. On top of (H) is a ¼" sheet of asbestos and attached to that is a handle by means of which this cover may be easily manipulated. Samples to be treated were put on the iron at a temperature of 200° C. for exactly 30 seconds. During this time they were covered by the metal cover. It was possible during the tests to maintain a temperature of within 1° of 200°C.

Solutions were prepared of .01, .001, and .0001 N H_2SO_4 and NaOH. In each of these solutions 20 strips of cotton were placed for 30 minutes. They were then squeezed and dried. Ten of the strips from each solution were treated with the hot iron by the method given above.

The sample strips after treatment were hung in a con-

ditioning room for 2 hours before testing. Standard conditions in this case were 65% relative humidity and 70° F. These conditions were maintained by means of a heating system and a humidifying system. After conditioning for 2 hours the strips were tested in a Scott Tensile Strength Tester. The machine was operated with 3" between jaws and a jaw speed of 12" per minute.

Table 8 gives the average breaking strength for each group of samples tested.

TABLE 8
BREAKING STRENGTH TESTS

	Not Heated	Heated
Untreated	39.4	34.05
.01 N H_2SO_4	25.67	2.2
.001 N H_2SO_4	34.0	21.25
.0001 N H_2SO_4	36.75	33.0
.01 N NaOH	41.75	37.7
.001 N NaOH	42.15	40.0
.0001 N NaOH	40.85	37.30

Conclusion

Facts had either not been generally known, or had not been determined in regard to the relation between pH and tensile strength of a fabric. These experiments have shown the effect of pH on the tensile strength, and the facts indicate that a manufacturer should control the pH during all the finishing and bleaching operations in order to have the cloth as strong as possible. It has been shown earlier that even slight decreases in pH from the standard tender the cloth greatly. It was also found that an ordinary bleached cloth was strengthened by treatment with dilute alkali. A pH determination would tell one just what concentration of alkali should be used to get the maximum strength.

Suggestions for Future Work

If more time were available the data would, first of all, be made more complete by determination of pH and tensile strength of bleached cotton cloth treated with solutions of sulfuric acid and caustic soda of normalities intermediate between those used, to see whether such small differences can be distinguished with the apparatus. Also, the series would be extended to include treatment with higher normalities than those used to observe the trend of effects on pH and tensile strength of higher acid and alkali concentrations. The next step would be to use unbleached cotton cloth, instead of the bleached cotton used, in a similar series of treatments. Tests to determine the true neutral point of the cloth would also be attempted.

It should be noted here, that since the completion of this work, an improved apparatus has been made for handling the extract, from the time of the boil-off through the time of making the pH determination, without danger of admission of CO_2-laden air at any point. The essentials consist of a combination suction tube and cooling coil that removes the extract from the boil-off flask and delivers it, cooled, to the quinhydrone cell for testing, without removal of a stopper.

It is desired to call the reader's attention to the fact that this work is the logical beginning of similar work on a series of other acids and alkalis. Hydrochloric, phosphoric, acetic, formic, oxalic and tartaric acids should make a most enlightening series; and as well as the alkalis, sodium carbonate and the phosphates should prove interesting studies. Heat-treatment with the hot-iron apparatus should not be overlooked, because valuable information lies in the determination of the effects of heat on cottons containing the various acids listed above.

Experiments along this line, however, need not be limited to bleached and unbleached cotton—the pH and tensile strength determinations of sulfur dyed cloth, vat dyed cloth and cloth dyed with insoluble azos or other dyes (especially those employing acids or alkalis in the process) should be of interest.

All these offer fields for research on cotton alone—but similar determinations can be applied to the other fabrics —wool, silk and the rayons—as well.

Thus, this research (which in itself proved most interesting) opens the possibilities for an almost limitless line of research that must surely be of value to the investigators and to the industry.

A New Method for Treatment of Rayon, Silk and Mixtures

A new practical, time-saving and economical process for scouring and bleaching, or for scouring, bleaching and dyeing to any desired shade in one operation, is being introduced to the textile trade by the manufacturers, the Surpass Chemical Company of Albany, New York, under the trade name of Surpalite.

This is a material that has been recently perfected by the company especially for use in the patented Surpalite processing of Rayon and Silk piece goods, as well as mixture fabrics, and the manufacturers claim that by this method the entire operation, which includes degumming, bleaching and dyeing, without intermediate handling, can be accomplished from start to finish in less than two hours. The same method is applicable for two and three fiber hosiery that can be readily degummed, bleached and dyed to any shade in a period of one hour.

The fabric is loaded into a reel dyeing machine that is the only essential equipment, and, as the entire operation takes place in one bath, no handling is necessary until the fabric is ready to be unloaded for the extractor. This means a material saving in time, handling and water, through the elimination of in-between rinses and prolonged use of steam.

The Surpalite method is said to be the most direct for obtaining and duplicating results, and produces clean, soft fabrics that, due to the minimum time consumed in the processing and handling, retain their tensile strength and luster.

Technical Notes from Foreign Sources

Running of Indanthrene Dyeings

E. B.—Faerber-Ztg. 66, 398 (1930).—Dyeings designated as Indanthrene Fast, and accompanied by the "I" label, are obtained by different methods of dyeing, as is, of course, the case with some other standard colors, as Turkey-red, Naphthol AS, and the Alizarine series. A definite and consistent behavior of these various fast dyeings, or of the dyestuff groups involved, in reference to fastness to washing and boiling, is difficult to establish. Theoretically it is possiblel, but it has significance only when the prescribed procedure is exactly followed. An inefficient treatment, e.g., incomplete oxidation before souring, and insufficient subsequent soaping, influences the fastness of the dyeings unfavorably.

Of course, we know that the Indanthrene dyestuffs do not, all of them, display the same fastness-properties, as is also the case with Naphthol AS dyeings. Even though some Naphthol AS dyeings show a somewhat better fastness toward washing and boiling than do some Indanthrenes, yet these faster dyeings hold out, under improper domestic laundering, as poorly as do the Indanthrenes complained of as unsatisfactory.

In the case of some, at least, of these only relatively fast dyeings, it happens that the goods, washed according to domestic conditions usually prevailing, bleed upon adjoining lighter areas of the goods. A running and consequent offsetting of the color does take place with strongly alkaline washing preparations, if the goods contain much starch and dirt (which will mean that the goods were not sufficiently soaked long enough before the washing proper). In the presence of alkali, and under the pressure of the superincumbent goods in the boiler, starch plus alkali acts as a reducing agent (chemically, alkali and carbohydrates are well known as forming a mild, but effective reducing mixture) upon Indanthrene dyeings. An addition of perborate to the wash-liquor usually somewhat diminishes this danger. Offsetting of the color takes place actually only in too closely packed washings, or when the goods, as is usually the case in household washings, are allowed to stand overnight in the wash-liquor, or allowed to stand too long in the wet condition before the actual washing.

Sulphonated Oils in Acid Dyebaths

Study No. 177—Faerber-Ztg. 66, 399 (1930).—A lot of combed yarn had been dyed with Palestine Fast dyestuffs, and when finished displayed dark spots over the entire surface. Close study of these spots showed that they consisted of fatty acids, which contained superficially fixed dyestuff. The reason for their origin was evidently due to the fact that, in the dyeing, the dyestuff had been stirred up with a Turkey-red oil preparation, which possessed no special stability toward acid. In the first stage of the dyeing, as long as the bath was not being heated to boiling, and the full amount of acid had not been added, no possibility of trouble was present, since the oil was being held with sufficient tenacity by the fiber. Only on the later addition of dyestuff and acid in the heat did the oil, which had been used for wetting out, become decomposed by the concentration of acid and degree of heat now effective, and separated out in the decomposed form, holding some of the dyestuff inclosed. In the case studied, it was found that by boiling for a while in a bisulphite bath the goods levelled up well.

The Mordanting and Dyeing Process

Prof. E. Elod, Dr. E. Silva, and F. Bochme—Monats. f. Textil-Ind. 45, 364 (1930).—Abstract of a lecture delivered by the senior author before the Dye- and Textile-Chemistry section of the German Chemical Association in the annual meeting of this year, at Frankfurt. He refers to earlier work upon the absorption of acid dyestuffs by wool, as showing that the part played by the dye-acids cannot exactly be compared with that of the weak, colorless acids added as "additions." He holds that, before the dye-acids are taken up, the formation of protein salts is a primary necessity. Only then can the Donnan ion-grouping, taking place in such systems, force the taking up of dyestuff acid anions. While up to the present a direct experimental proof of this view has not yet been possible, still, through simultaneous measurement of the alteration of hydrogen-ion concentration in the bath, and the taking up of the dyestuff, these (separate) processes in question can be followed up separately. It has further been possible to prove that, after the partial saturation of the basic groups of the wool-substance by dyeing with an acid dyestuff, and subsequent electrodialytic purification of the partly-dyed wool, the power of taking up acids, possessed by such wools, becomes distinctly and proportionally less, according to how much more dyestuff acid had been taken up in the pre-treatment.

In spite of these observations, which support the theory of the author, it may be pointed out that a series of other, still uncorrelated, factors play some part in dyeing. As we know, the presence of neutral salts diminishes the absorption of the dyestuff. But it has been found that the presence of the dyestuff itself in the form of its alkali salt, present in great excess, exerts an action similar to that of ordinary salts. Then, too, the dispersivity of the dyestuffs is influenced by the presence of neutral salts, a

fact which becomes evident especially at the beginning of the dyestuff absorption, when working with high concentrations of a salt. Other factors, still, influence the very complicated process of dyeing. Thus, in the relatively simple case of the absorption of picric acid by wool, it appears that the acid character of the picric acid is influenced by its simultaneous dyestuff character while it is being absorbed by the wool, especially at higher H-ion concentrations.

Fast Printing Process

German Patent No. 433,276 (27/VIII/'26)—*I. G. Farben-Ind. A.-G.*—The fabric is printed with a paste containing alkali salts of certain suitable passive azo-components, and salts of sulpho-nitrosaminic acids of amino-azo compounds, of the general type

$$R—N=N—R'—(NO)SO_2 \text{ metal}$$

in which R and R' are radicals of the same or different aromatic compounds; the fabric is then steamed, and passed through a bath of acid or of acid salts, and then into an alkaline bath. The color is thus developed. A modification of the method consists in the use of mixtures of nitrite and sulphamino-azo compounds, instead of the sulpho-nitrosamino compound.

An example for a deep, very fast black is as follows: a paste is made up containing 84 g. of a 50% paste of the sodium salt of o-phenetolel-azo-1-naphthyl-sulphonitrosaminic acid, 31 g. of Naphthol BS, 50 g. of Turkey-red oil, 30 g. of caustic liquor of 36° B., 305 cc. of water, and 500 g. of neutral starch-tragacanth thickener. This paste is printed upon the goods, the material dried, steamed for 5 minutes, passed through a bath containing 50 g. of hydrochloric acid of 22° B. per liter, rinsed, and then passes through a bath containing 8 g. of caustic liquor of 34° B. per liter (or an equivalent amount of carbonate). Finally, the goods are rinsed, soaped, rinsed, and dried.

Comment: The process consists merely in the ultimate diazotization and coupling of what is essentially an amino-azo compound to a second component, thus developing a diazo dyestuff upon the fiber. The use of the sulpho-nitrosamino compound is only a means of blocking the otherwise probably troublesome amino group until a suitable moment in the process. The same color could be produced as a solid pigment by coupling the diazotized amine, prepared as usual, to the second component.

Mordanting Agent

German Patent No. 446,219 (25/VI/'27) (*addition to G. P. No.* 348,530 *of* 5/X/'19)—*I. G. Farben-Ind. A.-G.*—This patent is concerned with substances of the Katanol group. The products mentioned in German Patent No. 400,242, or those produced by action of sulphur chloride upon phenols, are treated with alkali sulphites. The advantages of using these present products lies in the fact that they will go well upon the fiber (cotton or unions) in neutral or weak (acetic) acid solution.

Zinc Soap Spots from Interaction of Copper and Zinc

Study No. 178—*Faerber-Ztg.* 66, 399 (1930).—Some time after a copper water-reservoir had been installed in a certain plant, it was noticed that the goods washed in the plant displayed spots, sometimes large, sometimes small; spots which could be removed completely neither by soap or by spot-removing agents. These spots, on investigation, proved to be composed of zinc soaps. Their source was traced back to the presence, in the above-mentioned copper reservoir, of zinc-coated struts. Contact between the copper and zinc established a galvanic couple, resulting, of course, in the zinc passing into solution in the stored water to a considerable extent (slowly, of course, but definitely). The zinc-charged water, in the form of wash-liquor, reacted with the soaps used, as an ordinary solution of deliberately prepared and added zinc salt would, and the insoluble zinc soaps formed deposited upon the goods being washed, as such insoluble soaps always do. While the spots were fresh, they could be removed with dilute acetic acid, but after a little while they became steadily more resistant to solution. Contact of dissimilar metals, especially of certain kinds, under aqueous liquids deserves watchful attention.

New Mercerizing Processes for Cotton Piece Goods Containing Animal and Artificial Silk Fibers

A. J. Hall—Text. Manuf. 56, 181 (1930).—A discussion of some recent English patents relating to decided improvements in the process of mercerizing.

Two points in particular are brought out; one, that the damage caused by alkali in mercerization of goods containing animal fibers (a serious matter too well known) is not due to the strong alkali used, but to the diluted alkali formed in the first stages of washing the alkali out; the second, and a really surprising one, that strong caustic alkali really does have little (not comparatively little, but little) harm to animal fibers. Two references to this matter are made; (a) Buntrock, in Faerber-Ztg. 9, 68 (1898), found that wool immersed in 38 per cent caustic soda for 10 minutes at room temperature gained 30 per cent in tensile strength after removal of the alkali by washing, scouring, and drying; (b) Speakman, in J. Soc. Chem. Ind. 48, 321T (1929) in re-investigating the matter, has found that with individual wool fibers there is no appreciable gain in strength, but that on the whole the fibers remain essentially unaltered in both strength and elasticity.

English Patent No. 323,346 deals particularly with mercerization of cotton goods containing animal fibers. The gist of the patent (as is also the case with the others discussed) lies in the use of brine or other fluids for the washing out of the alkali of the mercerization-bath. H. points out that, beside the applicability of the process to cotton fabrics containing wool fibers for effect purposes, there are frequently encountered cotton fabrics with worsted selvages, particularly weaves destined to be dyed by the aniline black process; the selvage being sometimes

colored, but usually left white, in contrast to the black of the goods proper. When such goods are piece-mercerized, the woolen constituent may be made so brittle that it breaks or crumbles, or else, if this mechanical damage does not take place, at least the affinity of the wool may be so altered by the alkali that the wool loses its resistive powers toward various cotton dyestuffs which may be used. The selvages thus become stained, at the very least; and this is particularly to be noticed in the case of aniline black dyeings. This alteration of the dyeing properties of the wool takes place in the washing out of the alkali, when the concentration of the latter has dropped below a certain point.

It is experimentally evident that removal of the alkali by brine does leave wool or natural silk unharmed, and that removal of the alkali is more rapid with brine than with water. The solutions of other alkali salts and other substances, too, may also be used with the same advantage; e.g., various salts of sodium, potassium, or ammonium, glucose, cane sugar, or glycerol. Common salt is recommended because of its cheapness. Usually, for common salt, not less than a 12 per cent solution should be used. The wash-liquors may be collected and evaporated; since sodium chloride is almost insoluble in caustic soda of mercerizing strength, the recovered alkali is almost free from salt, and can go back directly into the mercerizing bath, while the salt is also pure enough to be used over again—no losses therefore, except through the unavoidable mechanical ones of recovery.

E. P. No. 323,307 covers the process in reference to cotton weaves containing artificial silk components. This is the third method which has been proposed, the other two being those of E. P. No. 295,484, and 295,488. This new method is even more effective in removing the caustic soda from artificial silk than from the cotton. Further, after mercerization, unequal grades of the artificial component will dye much more evenly together than before.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

PRINTER

Chemist-Colorist, 35 years of age, married, last 6 years Supervisor of Printing Establishment of one of the largest Eastern Plush Mills. Experienced in the printing of all colors on Mohair, Silk, Rayon and Cotton Plushes, also Brocaded Velvets and Soda Prints. Some Laboratory, Dyeing and Finishing experience. Will locate anywhere. Address: Classified Box No. 654, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Dyer, 38 years of age, married; 20 years' experience on cotton, rayon and mercerized, skeins and warps. Shade matching. Worked with direct, sulphur, developed and vat dyes. Best references. Full information upon request. Address: Classified Box No. 656, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

WHAT HAVE YOU THAT WE CAN MAKE OR SELL?

Well rated and highly regarded manufacturing, research and international selling and distributing organization successfully exploiting materials to several chemical consuming industries, desires to expand its operations to include the *Leather, Ceramic, Paper* and *Textile* industries, either as a manufacturer or sales agency for chemicals and associated products for these fields, or the Paint trade on an item to be manufactured only.

To a manufacturer with a staple or specialty for any of these industries, to a company having such a side-line or by-product, to a chemist who has developed but not exploited something in this classification; in fact, anyone regardless of his interest, we should like to correspond.

All correspondence will be considered strictly confidential. Address: Classified Box No. 662, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Boss dyer—38 years of age and married, with sixteen years' experience on piece silk; pure-dye, tin-weighted and mixed goods; best references; would consider position anywhere in the Untied States or Canada. Full information upon request. Address: Classified Box No. 664, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Dyer—Many years overseer cotton and rayon piece goods, any class of color; specialist on vats and ice colors. Can give results right away without special machinery. Stand all tests for fastness. Address: Classified Box No. 665, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Superintendent dyer available—Practical dyer of long experience on cottons, rayons and silk mixtures. Direct, developed, basic, vats and sulphurs. Pads, jiggs and reels. Also Celanese and crepes. Address: Classified Box No. 666, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.